THE MARINE REVIEW

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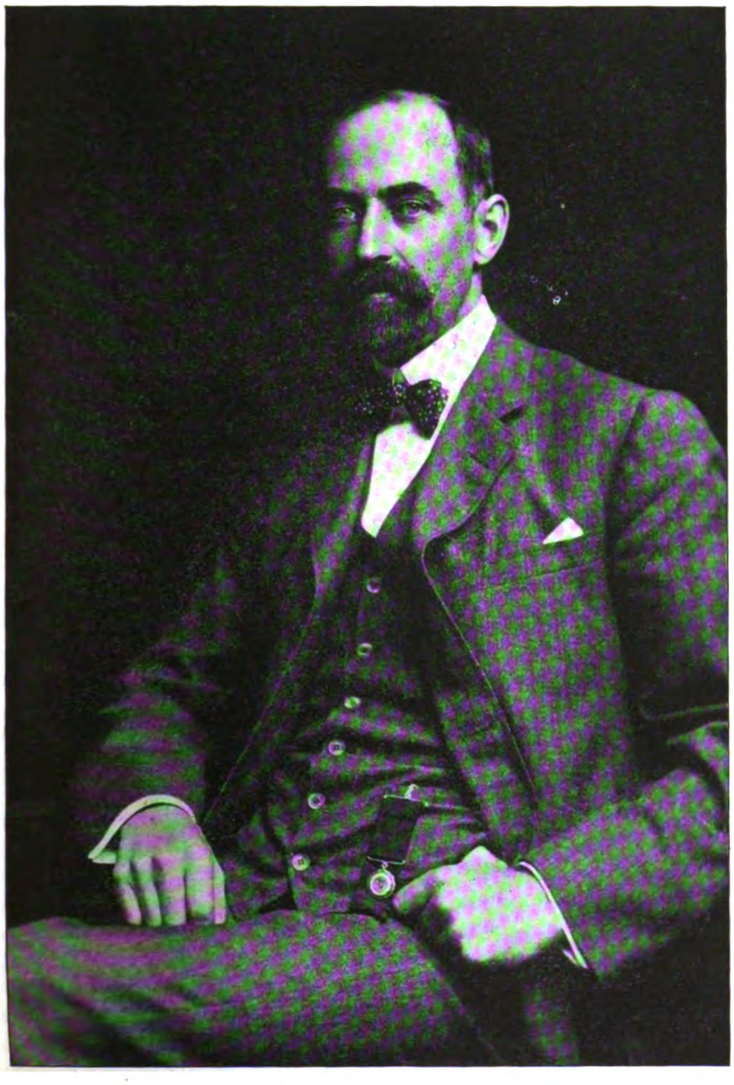
MR. LOUIS C. SABIN.

Mr. Louis C. Sabin, who lately resigned as disbursing agent of the American section of the International Waterways Commission, has gone to Sault Ste. Marie to assume the duties of superintendent of the St. Mary's Falls canal in place of Mr. Joseph Ripley, who has been appointed by President Roosevelt to supervise the construction of the locks of the Panama canal. Mr. Sabin has been active in civil engineering for the past twenty years. He began his professional career as engineering assistant on construction of the Bismarck waterworks, the C. & A. railroad bridge across South Fork, Chicago river, and Merchants' bridge at St. Louis, working under E. L. Corthell, G. S. Morison, J. Albert Monroe and H. W. Parkhurst. From 1890 to 1897 he was inspector and United States assistant engineer construction Poe lock, Sault Ste. Marie under Gen. O. M. Poe, corps of engineers and E. S. Wheeler, general superintendent, during which time he had special charge of cement testing and tests of other materials. In 1898 he measured the 10-kilometer base line near Galveston, Tex., under Major C. S. Riche, corps of engineers. From 1898 to 1902 he was assistant engineer United States lake survey, making measurements of discharge of St. Clair river and surveys of Lake Michigan shoals for revision of lake charts. From 1903 to 1905 he was again engaged in work at Sault Ste. Marie, making studies for movable dam above locks and for new lock, including investigation of current in canal caused by filling locks, rate of filling, movement of boats, etc. In 1905 he was appointed as secretary of the International Waterways Commission. During his connection with the commission it has printed reports on conditions at Sault Ste. Marie (use of water for power, etc.), and at Niagara Falls and has considered various other matters relating to boundary waters.



MR. LOUIS C. SABIN.

In 1890 the University of Michigan conferred the degree of bachelor of science (in engineering) and in 1894 he received the advanced degree of civil engineer. In 1905 he published his book on "Cement and Concrete," now recognized as a standard work on the subject.

CLYDE STEAMSHIP CO.

The net earnings of the Clyde Steamship Co. for the first six months of 1906 were $533,885, which is nearly 100 per cent in excess of the net earnings for the same period of 1905. The earnings for the first six months of the past three years are compared as follows:

	1906.	1905.	1904.
Net earnings	$533,885	$280,951	$277,392

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LAKE SHIP YARD METHODS OF STEEL SHIP CONSTRUCTION.

BY ROBERT CURR.

The turning of the frame, Fig. 54, shows the bottom framing and Fig. 55 the top side framing.

This method of framing makes an easy combination for laying off the work, but discrepancies will occur if care is not taken to lay out all the parts on the floor.

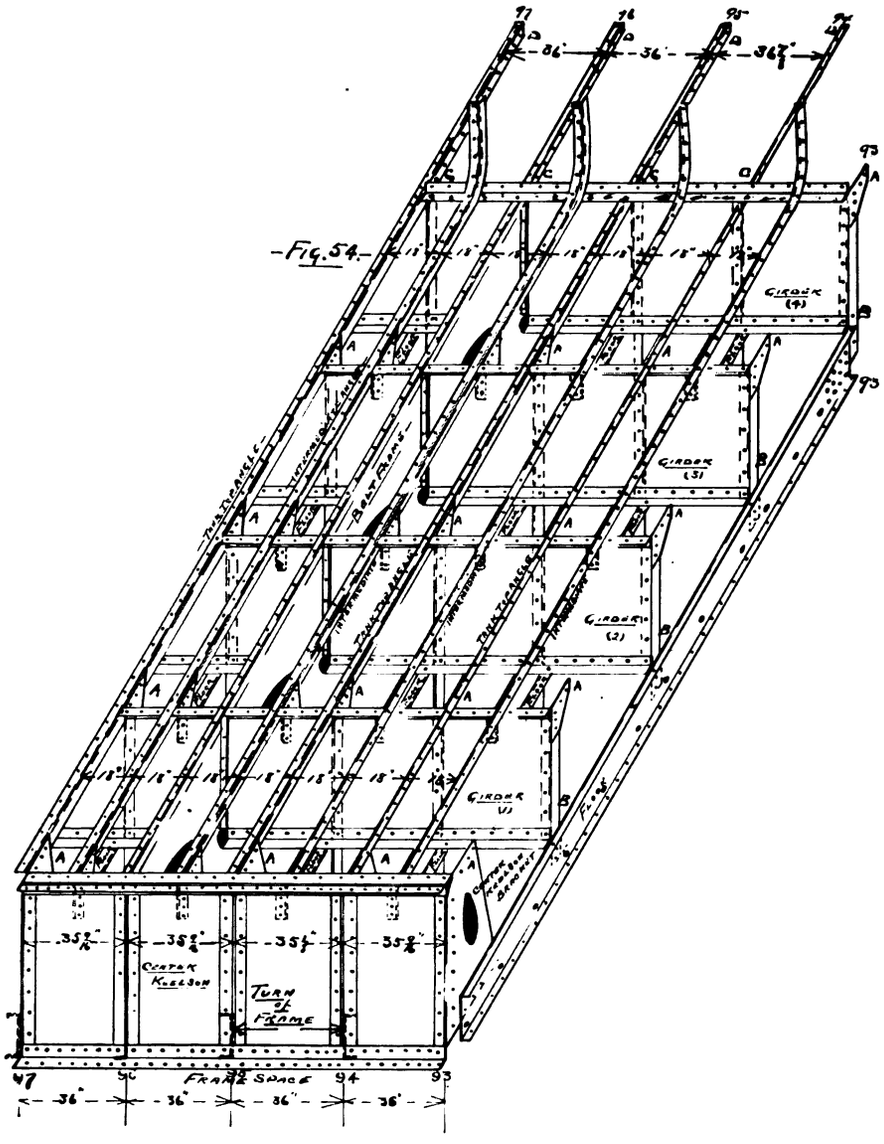

Fig. 54, the floor channel is spaced 36 in. apart from 50 ft. forward to 447 ft. aft. The top side frame being riveted to the floor, the frame from the keel to the spar deck is a straight line.

In this case of a frame turning it takes place at No. 95. The channel floor is looking aft in the afterbody and the frame looking forward in the same body. When the frame leaves the parallel part of the vessel, or dead flat part, the channel floor flange to the shell plating is closed and the frame channel on the top sides is opened. In the forebody of the vessel it is similar, the frame flange is opened and the floor closed to suit the tapering in of the vessel.

The heel of the channel frame and channel floor remains at the frame spacing throughout and any changes made are made on the inside of the vessel.

The frame space between Nos. 94 and 95 remains the same but the frame holes are a greater distance apart than the other spacing, which necessitates the changing of the rivet hole pitch on the seam in this space. The bottom plating will require inway of the channel floors the widening of the pitch of riveting, while the space above the floor where the frame turns will require closing up, Fig. 55.

If the shell plating was butted in the middle of the space there would be no change made in the length of the plates, but as a rule the butts are made between two rivet holes, taking the butt nearer the heel of the frame than the flange. The plates are always butted between the opening in the space or half way between the heel and edge of flange of the frame.

In the bottom the plate which crosses the frame turning space will require to be lengthened, while on the side of the vessel the plate will be shortened to suit the frame arrangement.

The lap butt plating is more in vogue now and with the exception of the keel and sheer strake the plating is all lap butted.

In this case the change of the frame is more noticeable because in the forebody the inside plate is carried right up to the edge of the flange on the side and the heel of the floor on the bottom, this allows the plate to be pushed up the thickness of the overlapping one, this allows the seam of the plating in the lap space to be easier faired up.

On the bottom, Fig. 54, the inside plate would require to be made longer where the frame turns, while on the side, Fig. 55, the plate would be shortened.

The outside shell plate is butted on the line of the heel at the opposite end of the frame space to the inside plate on the bottom, Fig. 54 in the afterbody and the edge of the frame in the forebody.

On the side, Fig. 55, the shell plate lap butt of the outside plate will be cut to the line of the heel of the frame in the forebody and the line of the edge of the flange in the afterbody.

The sight edge of the lap is always seen from the after end of the vessel and the inside plate lap edge is the width of the lap away from the frame and the outside in line with the frame. This enables a suitable liner to be fitted between the plates and facilitates the fairing up of the shell plate seams. This is about all to be considered on the shell plating where the frame turning is resorted to.

Referring to Fig. 54, it will be noticed that care must be taken in placing the brackets on the various angles in order to have the angles square across the ship and parallel to each other. On the center keelson the vertical angles are all arranged to suit the bracket plate on the channel floors. This bracket is 7-16 in. thick so that one angle is kept that distance away from the other angle which is in line with the channel floor, as shown at Nos. 93, 94, 95, 96 and 97.

At the turn of the flange, 95, the space is shortened up the two thicknesses of the brackets, being 35⅛ be-

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tween them and outside of this space the distance remains the same throughout at 35 9-16 between angles.

The main tank top angle A is fastened on to the center keelson bracket which connects the floor and center keelson together. It will be noticed that the floor fits close to this bracket at the center keelson, also the tank top angle.

The tank top angle must be in the same line with the floor in order to be square to the center keelson. The tank top angle is connected to the girder stiffeners with a ⅜-in. plate bracket while the bottom of the girder B is on the channel floor.

If the girder stiffener is laid out on the girder plate square to the floor, the tank top angle will be out of line three-eighths of an inch unless the bracket A is placed in the bosom of the girder stiffener.

The simplest way to do is to mark the holes on the girder plates ⅜ in. out of square.

This only applies to the tank top stiffeners, the intermediate angles being fastened to the girders and center keelson with flanged plate brackets. No trouble need be experienced in placing them as shown on Fig. 54, square to the center keelson and between the tank top angles.

Another obstacle turns up on the tank top angle if care is not taken. The top side channel frame being on the same line as the channel floor, the bilge bracket, Fig. 55, is seven-sixteenths thick which will throw the tank top angle out of line that much.

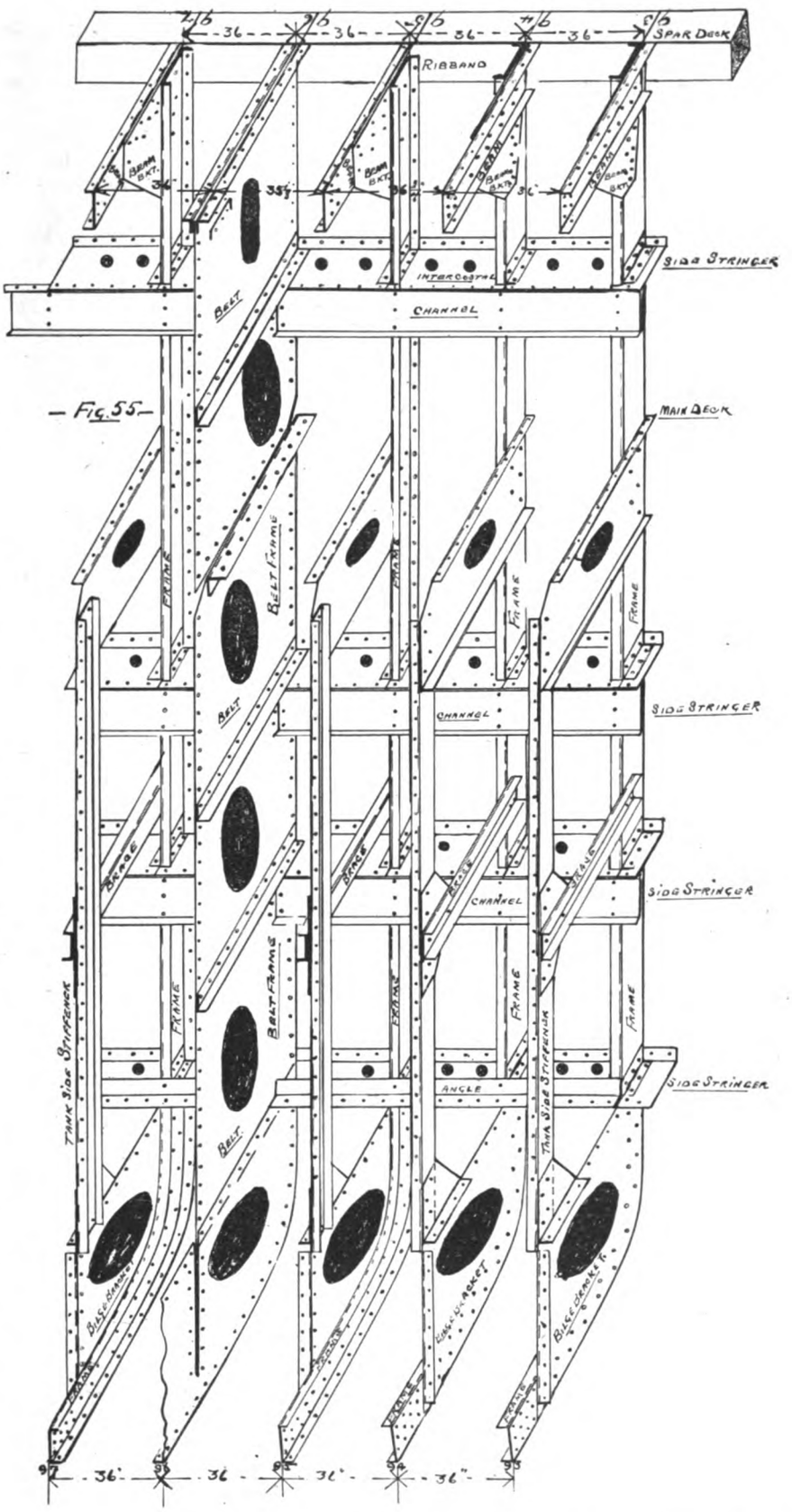
To get over this it will be necessary to bend the tank top angle 7-16 in. off a straight line. The part beyond C does not require to be looked out for in order to take care of the tank top plating, so by bending the angle will not be detrimental to any of the other parts. The girders being parallel to the center keelson there should be no trouble in getting the angles and girders square for the tank top plating.

If there should be any doubt about getting the holes fair on this work, the holes could be punched a size less and rimmed and countersunk in place. The holes are all rimmed anyway and the difference will only be the countersinking of the bar holes. The tank top is edge and edge placed so that there is no doubt about the holes clear of the angles under the plating.

The turning of the frame affects one space only from the keel to the spar deck, beyond that the pieces fit in similar to the spaces at the other side of the frame.

In the bottom the center keelson angles are 35⅛ apart instead of 35 9-16 and the holes for the intermediate angle brackets change in the next space; it is immaterial about them, so that the only change to look out for is the two bracket plates coming in that space that connect the floor to the center keelson.

On the girder the stiffener holes are closer, owing to the flange of the angles looking toward each other, but the distance between heels remain the same.



— FIG. 55 —

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The girder intercostals are plain in this space in the bottom and are the full frame space being the thickness of the floor less in length beyond this space and punched out for the flanges of the floors. On the side, Fig. 55, No. 4 girder stiffener angles are turned away from each other making a space between the stiffener holes greater than in the bottom on girders Nos. 1, 2 and 3. The side stringer intercostals are shorter the thickness of the frame than beyond this space and the intercostal is punched out for two frame flanges instead of one. The change in face angles and channels is in shortening up the holes in the space.

The main deck stringer has the frame space lengthened, the holes in the plate beam being farther apart than the other spaces.

Spar deck beams are similar to the main deck in this space, the holes being farther apart in this space, as shown by measurement from heel to heel of beam. The tank at side stiffeners are on the same line with the frame which means the closing up of the holes the same as shell holes.

On this vessel under discussion, the frames would not be turned until they came to the engine room bulkhead, so that everything from the stern to the engine room bulkhead remains the same for a distance of nearly 500 ft. This saves any changing amidships and takes the work clear of hatches, which saves quite a lot of risk where the material is most extensive. On this vessel the floors are shut bevel forward and open bevel aft, frames open forward and shut bevel aft. The slight bevel for this length does not cause any inconvenience whatever. There is 50 ft. forward where frame spacing is reduced to 24 and 18 in. The frames are six-inch channels and in one piece from the keel to deck.

There is also extra stiffening all being molded from the mold loft, one mold being used for each side of the vessel.

COLLINGWOOD SHIP BUILDING CO.

The Collingwood Ship Building Co., Ltd., Collingwood, Ont., has under construction at its yard the following vessels:

One bulk freighter for the Midland Navigation Co. to be 486 ft. over all, 466 ft. keel, 55 ft. beam and 30 ft. deep, equipped with triple-expansion engine, 23, 38 and 63 in. cylinder diameters by 42-in. stroke. She will have two Scotch boilers, 15 ft. six inches diameter by 12 ft. long, having a working pressure of 180 lbs. Three Brown cambered suspension furnaces, removable type, 50 in. diameter, each boiler.

One bulk freight steamer for the Farrar Transportation Co. to be 406 ft. over all, 386 ft. keel, 50 ft. beam and 28 ft. deep. Her machinery will consist of one single triple-expansion engine with cylinders 21, 35 and 57 in. diameter by 42-in. stroke, supplied with steam from two Scotch marine boilers, 14 ft. six inches diameter by 12 ft. long, 180 lbs. working pressure. Each boiler will be fitted with three Morrison removable type furnaces 46 in. in diameter.

One steel sea-going tug for the Dominion government for salt water service, 115 ft. over all, 111 ft. keel, 23 ft. beam and 13 ft. deep, molded. She will have one single triple-expansion marine engine, 15, 24 and 39 in. cylinder diameters by 25-in. stroke; one Scotch marine boiler, 13 ft. six inches diameter by 11 ft. long, with working pressure of 180 lbs.

Also for the Dominion government, three steel hopper barges 500 cu. yds. capacity each for salt water service.

NOTICE TO NAVIGATORS.

The new channel at St. Clair flats was opened for navigation as far as completed, on Monday, Sept. 3, 1906. This channel, which is parallel to and westward of the old or present channel, is 300 ft. wide and is completed to a depth of 20 ft. for a distance of 3,000 ft. below the St. Clair Flats canal lower light. The channel is buoyed as follows.

No. 1, dividing buoy, red and black 25 ft. spar, St. Clair Flats canal upper light S. 41 deg. W. 400 ft. Marks the dividing point between new and old canals.

No. 2, west side channel buoy, black 25 ft. spar, canal upper light S. 44 deg. E. 350 ft. Marks west side of upper entrance to new channel and division between new channel and old cut.

No. 3, west side channel buoy, black 25 ft. spar, canal upper light N .49 deg. E. 2,500 ft. Marks west side of new channel.

No. 4, west side channel buoy, black 25 ft. spar, canal upper light N. 45 deg. E. 5,000 ft. Marks west side of new channel.

No. 5, west side channel buoy, black 25 ft. spar, canal lower light N. 75 deg. E. 500 ft. Marks west side of new channel.

No. 6, lower buoy, black 25 ft. spar, canal lower light N. 42 deg. E. 3,000 ft. Marks temporarily the point where the new channel is left in order to enter the old channel.

A white lantern will be maintained at night on the lower spar buoy (No. 6) which will be moved down to keep pace with the widening of the unimproved portion of the channel.

Upbound vessels will take the old channel, or that passing between the dikes, and downbound vessels will take the new channel passing to the westward of the west dike and turning into the old channel at the turn marked by the last spar buoy (No. 6), keeping this buoy on their starboard bow.

NAVIGATING DULUTH CANAL.

By authority of the chief of engineers, United States army, under date of August 27, 1906, paragraph 3 of the rules and regulations for the operation of the aerial ferry across the Duluth canal is amended to read as follows:

3. *Right of Way.*—The car shall be run so as to give a clear channel to vessels, and shall always keep out of their way. Vessels will be required to give three long blasts of the whistle upon approaching the aerial ferry. Vessels are not expected to turn out for the car, except in case the car should be detained over the channel by accident.

By authority of the acting secretary of war under date of August 23, 1906, paragraph 9 of the rules and regulations for the canals and channels at Duluth, Minn., and Superior, Wis., are amended by inserting after the paragraph the following:

The signal for passing the aerial ferry bridge which spans the Duluth canal will be three long blasts of the whistle, or with the horn when the vessel is not navigated by steam power, and shall be given in ample time when approaching the aerial ferry.

A PREDICTION RECALLED.

The MARINE REVIEW in its issue of August 30 published the list of steamers of 500 ft. in length and over that have been constructed during the past two years. In this connection it will be recalled by many that less than a year and a half ago at a luncheon to the launching parties of the steamers Amasa Stone and James E. Davidson given at the Detroit Club, Mr. Henry Penton, at that time chief engineer of the Great Lakes Engineering Works, builders of the Davidson, referred to the remarks of previous speakers on the growth of lake shipping and recalled the criticisms heaped upon the builder of the first 400-footer, Mr. W. I. Babcock, then manager of the Chicago Ship Building Co., and his statement at that time that he expected to see the 500-footer for lake trade. Mr. Penton added: "I look to see the 600-footer before long." Some of the succeeding speakers were disposed to question the possibility of the 600-ft. ship for structural and other reasons. Yet the list published in the MARINE REVIEW contains thirteen ships of 600 ft. length or upwards and very recently Mr. James C. Wallace, president of

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the American Ship Building Co. was quoted as saying that his company had plans under way for a ship 645 ft. long, which may be accepted as an assurance that her appearance is a thing of the not distant future. It is certain that no one of those present looked for such an early and overwhelming confirmation of Mr. Penton's prediction.

ADVANCES IN TURBINES.

At a meeting of the British association held this year at York, Mr. Gerald Storey, C. E., contributed a paper upon "Some Recent Advances in Steam Turbines, Land and Marine." The author dealt first with the development in the use of steam turbines for driving dynamos and alternators from the first one made in 1884 by the Hon. Charles A. Parsons, C. B., F. R. S., of 10 H. P. to the great ones of up to 8,000 H. P. used in the great power stations of Carville, Neasden, Chelsea, Paris, etc. He described the further development of the steam turbine for driving rotary air compressors of the turbine type, now largely used for blowing blast furnaces and other work, and pointed out the advantages gained of light weight, small foundations, small consumption of oil, and above all, high economy of steam. These are generally for about 20,000 cu. ft. of free air per minute, and a pressure of 10 lbs. to 15 lbs. per square inch. A slightly different type is also made for about 30,000 cu. ft. of air per minute, at about one pound per square inch pressure, which are used in several large iron works and elsewhere for dealing with the waste gases from furnace and driving these gases through the recovering plant, etc., an important point being that they do not clog with tar and other matters. Since it is almost, if not quite, impossible to utilize economically low-pressure steam at about atmospheric pressure in a reciprocating engine, the exhaust steam turbine becomes of importance in many cases where there are non-condensing engines and other sources of exhaust steam.

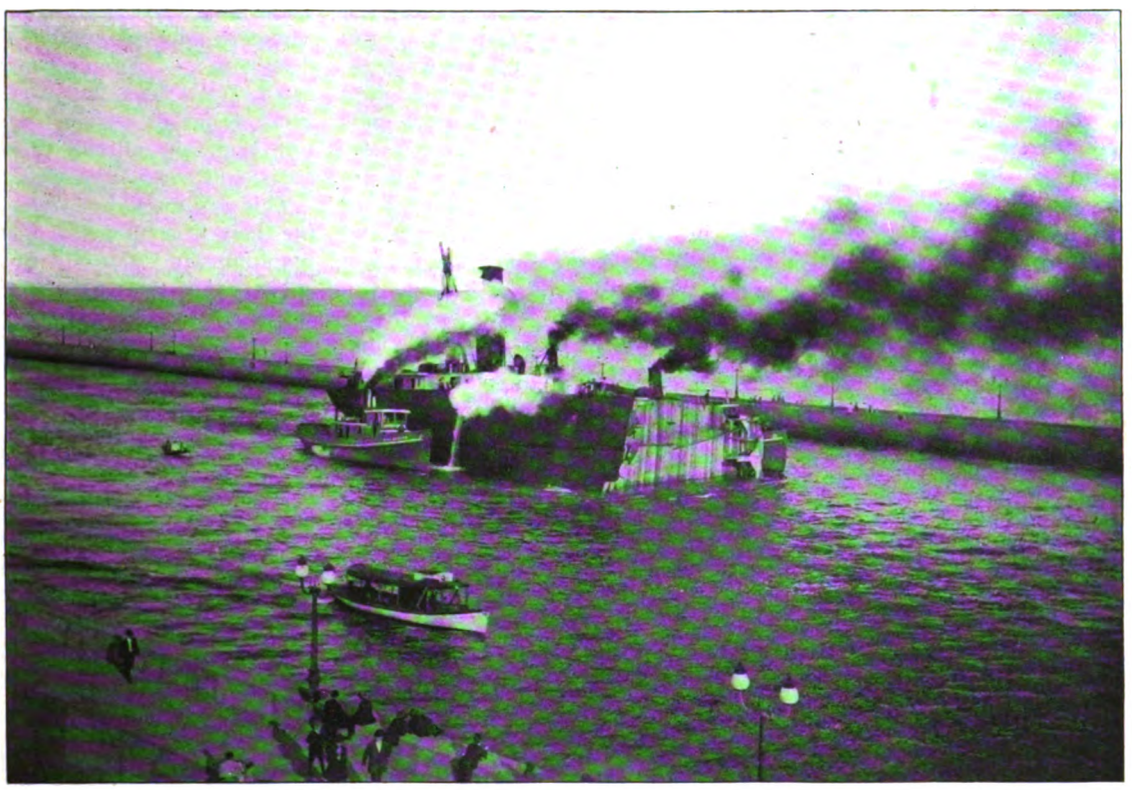
Prof. Ewing said it was a matter of great interest to the section to hear of the truly remarkable manner in which the steam turbine had achieved success. Genius was a rare quality, but Mr. Parsons possessed it. It was a far cry from the experimental turbine boat of 1897 to the 70,000-H. P. Cunarders now being built. The turbine had undoubtedly arrived, and everybody, he thought, shared the opinion that the steam turbine was the engine of the future, and that the reciprocating engine for most purposes was doomed.

Replying to subsequent discussion, Mr. Stoney said the problem of gas turbines was very difficult. He held out little hope of the application of turbines to motor cars, locomotives, or engines requiring a variable speed.

THE MECHANICAL FORCES OF A BATTLESHIP.

FROM *Page's Weekly.*

A good deal of criticism on the British admiralty's policy of naval education has been flying about lately; a deputation recently waited upon Lord Tweedmouth to place on record their objection to the new arrangement under which stokers will be allowed to discharge the watchkeeping duties in the engine-room. The first lord made it clear that the admiralty, in the policy they had adopted, had purely efficiency as their aim. "The artificers had not been withdrawn from the watchkeeping duties because of any bad opinion of the manner in which they performed those duties, but because they would be more efficient on board ship by confining themselves to their first duty —namely, the mechanical work. The subsidiary engines could perfectly well be kept in repair while the ship was at sea, and if that work was actually done at sea there would remain less work to be done in harbor. He certainly did think the admiralty's main idea was to set the artificers free to do that which they were primarily put on board ship, to do, to prove themselves skillful workmen, and



TOWING THE STERN OF THE STEAMER LAFAYETTE INTO PORT.

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there was no intention whatever of 'interfering' with the position of the artificer. Stokers did a great deal in the engine-rooms, and the promotion of these men who in the navy numbered something like 29,000, was a matter which they were bound to keep in mind. He did not agree with the suggestion that the training of the stoker did not fit him for the new duties." This puts the case for the admiralty in a nutshell. The other side of the question was well brought out at a recent meeting of the Institute of Marine Engineers, when a paper on the defence of the realm was read by Mr. W. J. Harding, R. N., M. Inst. C. E.

Speaking of the stokers, the author says that, after several years' experience, they become useful in the ordinary duties of stokehold and engine-room, but he does not think it can be claimed that they will ever fill positions of individual responsibility unassisted by any superior overseeing satisfactorily. Your fireman, he says, is an excellent man after some eight or nine years' experience, and he goes on perhaps to the higher grades, and long observation tells me that it is inadvisable, considering the average, to place him in a position where he alone is responsible for the working of the machinery or boilers in warships, and certainly I have great doubts as to his ever becoming a substitute for the present professional engine-room watchkeeper. I notice that the press publishes an outline of training for firemen, lately inaugurated, in which it is said that by the expenditure of not less than £500 of public money a chosen fireman of perhaps a few years' service as fireman is to be established as the responsible watch-keeping officer of our warship machinery.

The efficient fireman is he who can burn coal with economy. This is not learned in a short time; till it is learned the inefficient fireman may waste more than his day's wages in coal each twenty-four hours; and as economy in coal-burning is of the highest importance in warships, the coal-wasting fireman is also a factor of inefficiency. So that "Once a fireman always a fireman," but in superior positions, should be the rule if economy of fuel be desired.

I consider that it would make for greater efficiency in our navy if the ordinary fireman received wages approaching those paid in the mercantile marine, or if he even received wages equal to those paid to an ordinary police constable. I may be told that his pension, if he ever receives it, should be counted as deferred pay. I think that if the firemen were given the opportunities of the present seaman class, with pay commensurate to their arduous duties and attainments, they would be well content. In this respect it will be seen that, by curtailing the seaman class and increasing the fireman class, there is no reason against the latter performing dual duties of the stokehold and at the guns—they supplanting the seaman class, who are now only used for purposes of fighting, the actual navigation of the ship being performed by a small number of men. This would mean that the fireman might perform what may be called gun-deck duty and fire-room duty month and month about. Moreover, this would be no innovation—rather a reversion, for in former days of masts and yards and numerous guns the firemen used to do seamen's duties on deck and aloft when not under steam, and were also stationed to guns in action. Indeed, I understand that today, in some ships, the firemen are stationed to guns for action.

ENGINE ROOM ARTIFICERS.

Mr. Harding in this paper also discusses other features of naval training: As regards the engine-room artificers, the actual working engineers of the ships, he considers their present system of training and of qualification all that can be desired. These, he says, are the results of nearly forty years of experience, and forty years of experience which has produced a good article. Their training for entry into the navy costs the empire nothing. We who have an opportunity of viewing this matter apart from warship conditions must recognize that, without comparison with or disparagement of other mechanical men who enter other branches of our armed forces, the engine-room artificer is the best trained man. He is, or should be, an expert mechanic, capable of entering the race for attaining to some of the highest positions in the mechanical engineering world. Till recently his position in the navy was not all that could be desired, and now that the highest rungs of the engineering ladder—or perhaps it might be better to say his path up the sides of the engineering pyramid—in the navy have been cleared for him, all must rejoice at this very happy improvement, which will undoubtedly make for efficiency if continued.

This small concession—which is, however, extended also to the seamen class, and hence is not unique—may be greatly enlarged with great benefit to the public service. As he enters as a chief petty officer it does not seem necessary that there should be so many grades of engine-room artificers. These might be abolished as originally instituted. Entering at, say, twenty-one years of age, as an assistant engineer (title not of moment), he should, if qualified in actual technical attainments, apart from mathematical niceties, become an engineer, fourth-class, ranking as a warrant officer, at twenty-four years of age; an engineer, third-class, ranking with sub-lieutenant, at twenty-seven years of age; an engineer, second-class at thirty years of age, ranking with lieutenant; and an engineer, first-class, at thirty-five years of age, ranking with commander. Beyond this it is doubtful if ambition aspires. The retention of the term "engineer" is, however, to be advocated, for I find that there is still a great desire to refrain from the adoption of purely military titles.

OCCASIONAL AND LIFE-LONG SPECIALISTS.

This advocacy, continues Mr. Harding, may bear the view that it is of a revolutionary nature. But I would suggest that it also is in the spirit of a true conservatism of true "specialization," in that a lifelong specialist should be a more efficient public servant than an "occasional specialist," more especially as there is no finality to the development of machinery, and a sojourn in other positions apart from the engine-room may lead to an undesired state of "rust" or of ill-fitness for war or emergency conditions. For it must be borne in mind that the engineer officer of a warship may, perchance, be suddenly ordered to take charge of a strange ship, and this with a totally inexperienced crew, he and they being quite new to the ship. Therefore, for the sake of the machinery, continuity in engine-room duties would appear to be desirable. And though it may be urged that cessation of continuity and total dissociation from engine-room duties may not be of moment so far as one individual is concerned, provided he has an efficient staff under him, or provided he again becomes one of an otherwise efficient staff, yet there is always the consideration that such a system may have the germs of failure, efficiency for war service being considered.

So that I would advocate that, so far as the running of all mechanical appliances is concerned, there should be no such hiatus, and, so far as the actual watchkeepers and users of such appliances are concerned, that these should be charged with no other duties. This would mean a specialization in all mechanical appliances, of whatever nature, and whether used as weapons for propulsion, for electrical

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effects, or for any other purpose.

With a view of early initiation to the use of weapons, combined with the learning of discipline, I would advocate that all who enter as firemen or shore-trained engineers should first be put through a six month's course in the marine artillery barracks. This would be a great advantage in many ways, as there would be sufficient of the salt-water element to teach what ship life is to be, and the military training would well fit them to become a portion of what is called the "military branch" of the navy, which term is at present applied to that which I have called the "mariner branch."

I see no reason why the well-trained engineer who enters as an E. R. A. could not become an efficient torpedo expert in a small fraction of the time now passed by, initially, raw learners in that art and mystery before they become efficient. By this system very great economy would be given, as the now "mariner class" are evidently not the proper persons to be called upon to master such intricacies, if economy be desired.

Lieut. Carlyon Bellairs, R. N., M. P., who occupied the chair at this meeting, criticized the present naval policy at some length, referring at the outset to the enormous mass of machinery on board a modern battleship. In the King Edward, for instance, he found they had forty-two steam, ninety hydraulic, and fifty-five electric engines, making altogether 187 engines on board that ship. If they were to take the engines associated with the torpedoes they had to make an addition to the number mentioned. The engine-room artificers were introduced in 1869, and he thought Mr. Harding had spoken the absolute truth when he had referred to them as the backbone of the whole service. He had asked a question in the House of Commons a couple of days ago. He asked how the stokers were entered into the navy, and what examination they passed. The answer was that there was no examination on entry, and that they entered at the age of twenty. He had also asked about the artificers, and he found they passed a stiff examination, and that they had served an apprenticeship before entering, and that they very soon picked up their engineering duties. It seemed an extraordinary idea that the admiralty should be proposing to supplant those engine-room artificers as watchkeepers in H. M. navy, especially when the machinery was becoming more and more complicated. The next principle was that they should legislate for the average man. It was no good taking a few unique prodigies amongst human beings who perhaps could assimilate several professions. The average man was not equal to taking in a number of professions. There was about to be completed a battleship costing £1,800,000, and it would seem to him to be little short of criminality to trust that battleship into the hands of men who were not the best seamen in the world. He thought that was a very serious engineering question, because the man who went down into the depths of the ship was the one man who was almost absolutely certain to lose his life if that ship was rammed or run on to the rocks, so that he could not escape from the engine-room, as was the case in the Victoria. They were absolutely dependent on the seamanship of the man on deck for the safety of their lives. In 1904 there were no fewer than seventy-eight collisions and groundings of naval ships. That was at the rate of three a fortnight, and he was certain that state of affairs could be improved by better concentration of the training in seamanship. He found that on December 15, 1904, the admiralty issued a special circular referring to the want of seamanship displayed in taking colliers alongside the ships. Those small collisions did not get included in the list he had referred to, but it showed that the admiralty were alive to the fact that there was a want of seamanship afloat.

SEAMANSHIP IN THE NAVY.

A few months later the amiralty issued another circular, teaching officers how to handle their ships to avoid collision. It did not look as if the seamanship were as good as it should be. Then twelve months after the first circular they got the memorandum about the stranding of the Assistance. The officers were superceded, and at the court martial were censured. It was not by sending the executive officer nor by sending the seaman down for 50 per cent of his time into the engine-room to pick up that little knowledge which was "a dangerous thing"—it was not by so acting that they were going to cure the want of seamanship afloat. For years the gunnery was stationary; then they started concentrating on gunnery, and they had leveled it up very considerably, and they would level it up still more. The moment they started sending seamen down to the engine-room to do engineering jobs, that moment they would get worse seamanship. Lord Tweedmouth, in the house of lords—and his lordship had also made the same remark to the speaker in the lobby—had drawn a parallel between engineering and navigation. His lordship said that he did not see why, "since the navigation was handed over to the executive officer, he should not specialize in engineering for a certain time." Engineering, in the speaker's opinion, was a bigger job. Engineering was down below, whilst the navigation was on deck. The engineering down below was away from the seaman's job altogether, whilst the navigation on deck was where seamanship was required—namely, the handling of the ship. And there was another marked difference. Seamanship and gunnery did everything they could to develop the eye. Nearly all the information conveyed to the mind was by eye. He was ignorant of engineering, but he believed engineering was largely a matter of hearing, which was a different thing altogether. Thus far they had considered the effect on the executive officer. Next they had to consider the effect on engineering. The moment they had one profession including both engineering and seamanship they had this trouble—that, having entered the service with the idea a boy had of becoming a Nelson, that idea would remain with him all his time, and when he was down on the engine-room platform he would have both eyes on the bridge instead of devoting his attention to that great and noble profession of engineering, as he should do. They had seen that occur in the American navy. Before 1900 the Americans started the business of one officer doing all the jobs. One of the heads of the engineering profession last year reported that the result had been this—that the American navy was unfit to go to war! That was a very serious statement for the head of the engineering profession to make, but it seemed to be borne out by what occurred in the American warship Bennington.

Contracts for two of the three new steel fireboats, which are to be built for the City of New York, have just been let to the Vulcan Iron Works, Jersey City, N. J., at a cost of $237,850. Contract for the third will be awarded soon. Each of the new fireboats is to be fitted with turbine engines and will be 131 ft. long. It is estimated that each boat will be able to do the work of eight fire engines and the pumps used will throw 12,000 gallons, or 52 tons of water, 150 ft. high, each minute, and each boat will be able to throw eighteen streams at once.

The tug Tonawanda, of the Great Lakes Towing Co.'s fleet, has been sold to W. J. Scott, Oswego, N. Y., to be used in the canal boat trade.

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THE MARINE REVIEW

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SEPTEMBER 13, 1906.

SHIPPING BILL INDORSED.

The Republican state convention at Dayton on Wednesday of this week, placed itself on record as being in favor of the upbuilding of the American merchant marine in the foreign trade in the following terse sentence:

"Congress should encourage the upbuilding of our merchant marine to regain the carriage of our foreign commerce and to extend it."

The building up of the navy is indorsed in the following language:

"There must be no check in the policy of strengthening the American navy. A strong navy is the greatest guarantee of peace that we can offer to the world."

These sentences tell the story quite as well as longer ones. The Republican party of Ohio has declared itself unequivocally for building up the merchant marine in the foreign trade. On Tuesday evening, Mr. Harvey D. Goulder, president of the Merchant Marine League of the United States, sent a telegram to Senator Joseph B. Foraker at Dayton, urging indorsement of the shipping bill and at the same time referring to previous indorsements of the subject. His telegram was as follows:

"At the request of our league members, I refer to the resolution of the Ohio state convention of June 4, 1903, and of May 25, 1905, and urge the latter. I also call attention to McKinley's words in the house May 7, 1890, as follows: 'If the United States would give the same encouragement to her merchant marine and her steamship lines as is given by other nations to their ships this commerce on the seas under the American flag would increase and multiply. When the United States will spend from her treasury from five to six million dollars a year for that purpose, as do France and Great Britain to maintain their steamship lines, our ships will plow every sea in successful competition with the ships of the world.'

"And in his last words at Buffalo McKinley made his memorable plea for wider markets with a fervent demand for an American merchant marine, saying: 'Next to the advantage of having the thing to sell is to have the conveniences to carry it to the buyer. We must encourage our merchant marine. We must have more ships. They must be under the American flag, built and manned and owned by Americans. This will not only be profitable in a commercial sense, but it will be a messenger of peace and amity wherever they go.'"

During the past two years demands for the passage of a bill to remove the handicaps imposed upon American shipping in the foreign trade have come from all quarters of the country. These petitions have come from no special element, but have included the banking, manufacturing and agricultural interests of the country. Boards of trade from north to south and from east to west have urged the passage of this bill. Manufacturers who travel abroad, especially to South American ports, have unanimously testified that they are handicapped by the lack of transportation facilities. Bankers have urged the necessity of national transportation lines to facilitate the establishing of branch banks abroad. Everywhere it has been pointed out as an absurdity that a nation as great as the United States should absolutely depend upon foreign countries for the transportation of its own products. While the foreign trade of the United States has grown to the astounding total of nearly $3,000,000,000, the tonnage of American ships engaged in this vast trade is almost less than it was one hundred years ago. Unless this condition is remedied, the American nation will some day pay a royal price for its negligence. The foreign market is necessary to maintain American prosperity at high tide. Great as its home market is, it is not sufficient to keep its mines and mills in full operation. Any act, therefore, that would deprive American manufacturers of free access to foreign markets would stagnate American industry and create widespread disaster. Such a condition could easily be accomplished by the withdrawal of foreign tonnage from the American over-sea trade. Such withdrawals would inevitably follow the declaration of war between two European nations. Such a declaration is not impossible.

The United States has the largest navigable coast line in the world. It is essentially a maritime contry. All maritime countries should be self-contained. They should build their own ships and man them. They should carry a just proportion of their own products abroad in their own vessels. Ship yards of the United States are today engaged in building vessels for the coastwise trade and for the American navy. No vessel is being built for the foreign trade. In the building of naval vessels the real problem confronting the nation is the manning of them. The real cradle of the navy is the merchant marine. You can't march a troop of soldiers aboard ship and expect them to fight intelligently. The sea habit can be acquired only after long service in the merchant marine. The nation should encourage the upbuilding of the merchant marine both for business and patriotic reasons. It is hoped that with the endorsement that the shipping bill is receiving throughout the country, congress will be prevailed upon in its next session to enact into law the measure that has already passed the senate.

THE PORT OF GALVESTON.

In September, 1900, the city of Galveston was wrecked and one-sixth of its population destroyed by a tidal wave. That was exactly six years ago. Today the water front of Galveston is protected by a solid concrete wall 4½ miles long, and the task of raising the greater portion of the

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city 14½ ft. above sea level is one-third completed. Consider what this means. It has meant the elevation above grade, about seven feet on the average, of street car lines, water mains, gas pipes, houses, business blocks and churches. The rebuilding of Galveston is prompted by the natural advantages of the port and the people of the southern city have risen magnificently to the undertaking. Galveston's natural advantages are so many that it must become the great shipping center of the south. It is to the credit of Galveston as a municipality that it has recreated itself without outside aid. That shows faith in its own destiny.

AT HEAD OF THE LAKES.

Duluth, Sept. 11, 1906.—The shipment of coal away from the docks to the interior is increasing and there is no congestion at this point though the docks are comfortably filled. The domestic buyers of coal and the dealers are not so prompt in taking care of their allotments but the mines are beginning to be well stocked for the winter. The larger boats are not so eager for coal cargoes at present which restricts somewhat the number of boats available in the trade but not sufficiently it is thought to bring any advance in the present rates. The receipts of soft coal on Lake Superior for the year up to September 1 were 4,412,419 tons. This was 985,385 tons better than last year when 3,427,034 tons were brought up. Not quite so much hard coal was brought up this year, the figures being 513,783 tons against 550,786 last year.

The fall grain movement was on the eve of commencing during the past week and by this time is quite under way. The rate will remain at 2½ cents until the 15th when it will go to three cents as per contracts already made for the latter half of September wheat. The statement of grain receipts for the week under review do not indicate as yet the movement of grain from the interior but Monday of the present week saw the beginning of heavy shipments. For the fourteen days ending Sept. 7 the receipts and shipments of grain at this point are as follows:

	Receipts		Shipments	
	Sept. 1.	Sept 7.	Sept. 1.	Sept. 7.
Wheat	73,027	432,473	420,906	66,085
Corn	.....	1,992	14,147	.....
Oats	...139,286	102,969	89,932	78,627
Barley	.107,528	213,200	85,066	206,496
Rye	... 9,525	11,637	.....	.....
Flaxseed	95,056	59,230	70,507	318,490

The shipment of ore continues to be a moderate tonnage though because of the very small shipments from the Duluth and Two Harbors docks during this week last year, a gain of over 300,000 tons was made at those docks this year. At Superior the increase was merely nominal. The Stevenson mine, heretofore the biggest shipper to Superior will produce nearly 500,000 tons less this year than last it is thought, while the Mt. Iron mine, the biggest producer shipping over the Missabe will send down more than 500,000 tons more than last year. The figures for the week Sept. 1-7 are given below: Two Harbors, 281,265 tons; Duluth, 382,738 tons; Superior, 194,372 tons, a total of 858,375 tons. Last year the corresponding statement shows that Two Harbors shipped 179,644 tons; Duluth, 182,802 tons and Superior, 192,837 tons a total of 555,283 tons or 303,192 tons less than this year. The shipment this year up to the 7th from the above docks is 16,077,337 tons as compared with 14,328,217 tons for the corresponding period in 1905. This is a gain of 1,749,120 tons.

The steamer Edenborn was brought into Duluth harbor Saturday morning at 3:30 and towed in alongside the stern of the Lafayette. She is broken near the middle and her bottom is damaged, just how much cannot be determined until she is put in drydock. She will be tied together at the Superior yards and will then be sent to one of the lower lake drydocks. The steamer was released by Capt. James Reid, who is now preparing to recover the machinery of the steamer Sevona. The Sevona broke in two, one of the first steel steamers to do so, more than a year ago on one of the Apostle islands. The Reid Wrecking Co. purchased the wreck. The steamer Peavey which has been in drydock at Superior as a result of beaching on the north shore three weeks ago is ready for service again. The drydock in which the Peavey has been will be taken immediately by the City of London which has been anchored at the Pittsburg Coal Dock for two weeks having lost her wheel coming across Lake Superior.

The A. Y. Townsend started on her maiden trip this week with slightly over 10,000 tons of ore from the Missabe docks. She took clearance papers for 11,000 tons but only took a moderate load. On the same day, Saturday, the new Joshua Rhodes of the Valley Transit Co. arrived with a load of 7,500 tons of soft coal for the Northwestern Fuel Co. The new boat is being sailed by Capt. Thos. Simmons formerly on the B. F. Jones, and she handled splendidly on the trip up. Capt. W. H. Hill, chief engineer of the Valley Transit Co. made the trip on her. She will take back ore from the Allouez docks.

At the Superior ship yards the building of the 600-foot steamer for the Pittsburg Steamship Co. has been delayed by the non-arrival of the keel material. The new boat will occupy the place vacated by the Townsend. On the other side of the dock the Hawgood steamer whose bottom plates were laid a few days before the launching of the Townsend is progressing slowly but will be launched some time during the winter, followed closely by the Pittsburg boat. The Mataafa will undoubtedly be in drydock all winter but will begin the season next year. President Wallace, of the American Ship Building Co., visited the yards during the week.

Considerable discussion is current among vesselmen as to the proper design of structure most desirable for replacing the Interstate bridge wrecked by the steamer Troy. The clear span on either side of the old bridge was ample, 200 feet, but it is felt there should be a double draw or some arrangement whereby a second channel might be available should one become blocked again. It has also been proposed that there be no bridge at all but that traffic between Duluth and Superior be carried through a tunnel to be built on the bed of the river, of concrete construction. Everyone concerned is greatly interested in having the best plan adopted at a point of such importance to traffic.

Capt. Sam Gould, shipping master for the Lake Carriers' Association, took the initiative at Ashtabula last week in drawing the lines on ordinary seamen who ship on a boat and jump her before she goes out. John Shannon was sent from Cleveland to the steamer Pathfinder and as soon as he ate a hearty dinner aboard, he left her. Capt. Gould heard of it, and Police Judge Starkey's aid was asked. The man was arrested for obtaining money under false pretences, tried, fined $10 and costs and sentenced to 10 days in jail at hard labor. The court said he would make it 60 days for the next. T. J. McCoy, agent for the seamen's union at Ashtabula, deserves credit for aiding Capt. Gould in taking this step.

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COMMERCE OF LAKE SUPERIOR.

The total freight movement through the canal at Sault Ste. Marie, during August, was 7,343,727 net tons. The movement during the preceding months was as follows: May, 5,339,278 tons; June, 7,025,255 tons; July, 7,732,771 tons. To Sept. 1 of the present year the movement has been 29,954,278 tons, the greatest record of any year. Following is the summary:

MOVEMENT OF PRINCIPAL ITEMS OF FREIGHT TO AND FROM LAKE SUPERIOR.

Items	To Sept. 1, 1906.	To Sept. 1, 1905.	To Sept. 1, 1904.
Coal, anthracite, net tons	513,783	550,786	518,574
Coal, bituminous, net tons	4,412,419	3,427,034	2,355,166
Iron ore, net tons	21,247,365	19,596,553	8,696,180
Wheat, bushels	30,660,574	16,086,194	18,617,797
Flour, barrels	3,126,994	2,156,092	1,645,403

REPORT OF FREIGHT AND PASSENGER TRAFFIC TO AND FROM LAKE SUPERIOR, FROM OPENING OF NAVIGATION TO SEPT. 1 OF EACH YEAR FOR THREE YEARS PAST.

EAST BOUND.

Items	To Sept. 1, 1906.	To Sept. 1, 1905.	To Sept 1, 1904.
Copper, net tons	62,033	56,580	48,817
Grain, other than wheat, bushels	28,262,603	12,705,843	8,744,364
Building stone, net tons	1,472	7,463	11,284
Flour, barrels	3,107,910	2,118,917	1,645,296
Iron ore, net tons	21,247,365	19,596,553	8,696,180
Iron, pig, net tons	17,463	39,724	21,190
Lumber, M. ft. B. M.	552,891	570,119	493,324
Silver ore, net tons			1,313
Wheat, bushels	30,660,574	16,086,194	18,617,797
Unclassified freight, net tons	103,014	55,137	51,748
Passengers, number	25,168	20,384	13,881

WEST BOUND.

Items	To Sept. 1, 1906.	To Sept. 1, 1905.	To Sept. 1, 1904.
Coal, anthracite, net tons	513,783	550,786	518,574
Coal, bituminous, net tons	4,412,419	3,427,034	2,355,166
Flour, barrels	9,084	7,175	107
Grain, bushels	6,749	1,533	625
Manufactured iron, net tons	204,116	65,829	69,904
Salt, barrels	276,551	257,206	248,837
Unclassified freight, net tons	575,972	408,955	285,485
Passengers, number	25,666	23,164	13,946

SUMMARY OF TOTAL FREIGHT MOVEMENT IN TONS.

	To Sept. 1, 1906.	To Sept. 1, 1905.	To Sept. 1, 1904.
East bound freight of all kinds, net tons	24,204,547	21,673,180	10,576,709
West bound freight of all kinds, net tons	5,749,731	4,491,619	4,266,266
Total freight, net tons	29,954,278	26,164,799	14,842,975

Total number of vessel passages to Sept. 1, 1906, was 13,691, and the registered tonnage, 24,097,454.

ANOTHER UNLOADING RECORD.

Records for two hoists in unloading coal from a lake freighter were smashed on August 20 at 6 o'clock when after ten hours' work on the big steamer H. S. Sill two Brown hoists on the Northwestern electric dock had taken out 4,200 tons of hard coal. The previous best record at the head of the lakes was something around 3,200 tons so that the new record set by the Northwestern dock is about 1,000 tons faster than any other.

CROSTHWAITE-WARREN COLLISION.

The schooner Wm. Crosthwaite, Port Huron, sank in collision with the steamer Homer Warren off Kelley island on Thursday morning last. The Warren and Crosthwaite had loaded stone at the Kelley Island Lime & Transport Co.'s south dock for Duluth-Superior. The Crosthwaite anchored about two miles out while the Warren went to Sandusky for fuel. Four hours later she approached the Crosthwaite running alongside just as the anchor of the Crosthwaite was raised. She struck the bow of the Crosthwaite and the anchor penetrated both boats, the Crosthwaite having a big hole torn through her timbers below the water line. The crew was picked up by the Warren and taken to Kelley's island.

MILL-MILWAUKEE COLLISION.

The wooden steamer Nelson Mills was sunk in collision with the western liner Milwaukee in the St. Clair river just below St. Clair, Sept. 6. The bow of the Mills was crushed and she sank, bow first, after drifting about a half a mile. The Milwaukee lowered her boats and succeeded in rescuing the crew with the exception of Mrs. Melissa Moore, wife of the engineer, and James Barber, a wheelsman. Capt. Osborn, of the Milwaukee, was on his way to dinner when the collision occurred. A member of the crew of the Milwaukee says that the Mills blew cross signals and struck the Milwaukee on the starboard bow. The Milwaukee's forepeak was filled with water. The Mills at the time was towing the schooner Alex Anderson and was bound for Algoma with a cargo of coal. She was owned by the Mills estate of Marysville, Mich. She was valued at $12,000.

COREY'S UNLOADING RECORD.

Following is the detailed data of the unloading record made at Conneaut by the Hulett and Brown electric automatic unloaders on the steamer William E. Corey, Sept. 2, 1906, with 9,574 tons of group one ore. Boats have been unloaded faster at this dock, but never before in the last few hours of the week, when the work was all done during darkness:

Unloaded by Huletts ..... 5,680 tons
Unloaded by Browns ..... 3,894 tons
Total time at the dock ..... four hours 29 minutes.
Total tons unloaded per hour 2,127.5
Arrived 1:06 A. M. Finished 5:35 A. M., local sun time.

Average tons per hour per machine, gross time.

Huletts 339.1
Browns 249.6
Both 296.1

Average tons per hour per machine, net time.

Huletts 389.04
Browns 284.24
Both 338.3
Total net unloading time ..... three hours 32 minutes.
Tons put aboard cars 7,505-1,900
Tons put on dock 2,068- 340

Since the opening of navigation at Buffalo, 1,419,076 tons of coal have been shipped from that port, the month of August carrying the record, with 467,968, an increase over July of 147,942 tons. Shipments of coal from Buffalo during the month of August were distributed among the various lake ports as follows: Chicago, 140,240; Milwaukee, 118,326; Superior, 79,150; Duluth, 57,700; Sheboygan, 16,900; Fort William, 13,000; Waukegan, 12,400; Green Bay, 6,900; Racine, 5,565; Soo, 3,600; Port Arthur, 3,100; Gladstone, 2,500; Escanaba, 1,980; Marquette, 1,947; Algonac, 1,120; Portage, 1,100; Manitowoc, 850; Bay City, 800; Petoskey, 600; Lake Linden, 640; Parry Sound, 1,000; South Chicago, 5,600; St. Ignace, 500; Toledo, 450; Port Sanilac, 280; Port Colborne, 150, and Byng Inlet, 100 tons. Canal men say this season is sure to be a record breaker for business. Up to the close of last week 1,500 clearances for the season had been recorded. The number for the corresponding period last season was 1,100.

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A LOGICAL SOLUTION OF THE LOCK QUESTION AT THE SAULT.

WRITTEN UPON REQUEST BY R. J. MCKEONE, ASSISTANT SUPERINTENDENT, ST. MARY'S FALLS SHIP CANAL.

A new fast operating lock should be built north of the Poe lock. Dimensions, 750 ft. long; 75 ft. wide, and 30 ft. deep, so constructed and operated that a boat moving at a maximum locking speed could be locked either up or down without slacking speed. To accomplish this the lock should be filled from the sides from 30 by 30 ft. culverts located in the lock walls. There should be separate adjustable openings for filling and emptying purposes respectively, leading from the culverts to the lock chamber at spaced distances extending the length of the lock in both walls. The openings should be so graded and adjusted as to size, that they would both empty and fill the lock uniformly its entire length. Automatic hanging valves should be so arranged over these openings that each set would perform their respective functions, that is, open or close, as the filling or opening pressures were applied. The culverts should be filled through a tunnel 10 ft. below the deepest draught boat, when on the upper level, from a side bay formed in the rapids, of ample dimensions to furnish all the water required to fill the lock as rapidly as desired. The filling and discharge openings each to be equal to at least one and one-fifth times the cross section of the lock. Balanced suspension lock gates should be used. These could be opened or closed against any head or current of water. With this style of gate much time could be saved as they could be opened without waiting the slow action of the last few feet in discharging or filling. The lock floor and high breast wall should be discarded. This would give about 15 ft. added depth without extra excavation. The lock should be at least 10 ft. deeper than the deepest draught boat. This extra depth should extend at least 500 ft. beyond either end of the lock, thereby enabling loaded boats to safely hold steerage-way when entering and until they cleared the lock, and the waiting boat, if any. The water should discharge from the end of the lock walls, and not through the lock chamber as at present. By this arrangement if the emptying valves were left open, when a boat was entering or leaving the lock, the water could escape and allow her to enter freely, or rush in to fill her displacement when leaving, thereby making it possible for her to hold her course when moving at rapid locking speed. Lack of free water circulation is one of the principal causes of delay in the present system. There should be floating guide piers extending 500 ft. from either end of the lock with ample water under them to eliminate pier suction which is the cause of much delay as it makes boats unmanageable. There should be a wind break the entire length of these piers to enable light boats to safely enter the lock with reasonable speed during a wind. This cannot be done at present without damage to the lock or boat. The side bay could easily be formed by building a dyke commencing at the head and building downward along the boundary line to the foot of the rapids. A temporary wooden dam at the head from the dyke to shore would stop the flow of water while a permanent stone dam was being built at the foot of the rapids from the dyke to the north wall of the new lock. This dam should be so constructed that the water could be retained, let flow, or used for power purposes as desired. From this bay sufficient water could be taken to fill all the locks, and to fill the new lock particularly, if properly constructed, in less than one-tenth the time it takes to fill the Poe lock by the present method. Were such a lock constructed with other necessary mechanical appliances, it would be quite possible to lock through it, ten of the largest of present day boats in one hour, without damage to either lock or boat, or in other words five times the number that it is possible to handle in the Poe lock at the present time. Power could be given in exchange to the Chandler-Dunbar Co. for that destroyed by the formation of the side bay and a strip of shore line property needed at the west end for the new canal approach to the new lock, thereby settling the question of their vested rights, without cost to the government or arbitrarily depriving them of any rights they may have in the rapids. A small portion of the power developed would be required for government purposes. The balance could be rented in time, at a figure which would materially lessen the annual expense of operating the locks. It may be contended that the government could not or should not enter into the business of renting water power. I ask, if not, why not? In this case there would be an abundance of power, if not rented, going to waste. If the locks were filled from a side bay of the dimensions suggested, boats would not have to contend with the dangerous currents in the canal incident to filling the locks. This feature vesselmen will readily appreciate. A new canal would not be needed for the new locks, as the contemplated widening of the present canal, with possibly a slight change would accommodate all the locks. At first blush, building a dyke in the center of the rapids might look like a difficult undertaking, but it would not be if properly handled. By carrying out the ideas herein advanced, ample locking facilities would be furnished the great and growing traffic of the lakes for years to come, and when in these coming years, the traffic should again exceed the locking facilities, the Weitzel and Poe locks could be converted into rapidly operating locks also; thereby meeting all locking requirements for all time, as the three locks could safely handle, without delay, all boats that could safely, by reason of numbers, navigate the St. Mary's river. Every pound of energy now going to waste in the American half of the rapids could be utilized, an economic consideration which should not be overlooked by the government, as waste in any form is not excusable. A great city would grow up at the rapids as the result of harnessing this power, and the question of vested rights in the rapids could be settled without controversy or injustice to anyone. The question of lake levels in Lake Superior would also be settled for all time, as there could not be used but the natural flow of the rapids, and that could be checked if necessary. With balanced gates, properly constructed, and closed at both ends of the lock, it would be quite possible, if the power was detached by throwing off the brakes, to lock a boat through (down bound) without opening the gates; that is, the boat could drive open the upper gates, pass through the lock, drive open the lower gates, and go on without damage to the boat, gates or lock. The gates could be closed even against the current that would result from such a move, and the next boat locked up as if nothing happened. This statement I know will be looked upon as a cracked-brain absurdity, but it is true nevertheless. With such gates there would be no detention with ice, spring and fall as with the present gates, as the lock could be opened up and the canal cleared of ice in a few minutes, also, by reason of this fact the lock could be operated all winter if desired. A lock could not be safely or successfully used if built out in the rapids outside the Chandler-Dunbar Co.'s tail-race. Crossing the currents

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with loaded boats to reach the lock would not be practicable. All continuous currents between the lock and the shore should be shut off, so that boats would approach the lock in dead water. It will be questioned why a small lock should be able to lock the greater number of boats. The reasons are: when two or more boats are locked at the same time, they have to wait for one another to move in and out of the lock, a time loss of from two to five times more than the actual time of lifting or lowering the lockage. This time would be saved with a short single lock, as the moment the boat being operated on was in the lock, the process of locking would commence, and should, and would be completed, in a fast operating lock, before the next coming boat could possibly get close enough to require the lock before it was ready for her; consequently there would be no delay. There are other reasons, but this one should be sufficient to commend the short lock. The word "fast" herein must not be construed to mean that boats in the regular process of locking will be shot through the lock as an Indian shoots the rapids with his birch bark canoe, accompanied by a war whoop, and just missing things by hair-breadths; on the contrary the speed required will be no greater than that attained many times at present by light boats, nor no greater than what ought to be, nor than that which would be attained by loaded as well as light boats, if there was free circulation of water provided to fill their displacement as they moved ahead, which there would be in this style of lock, consequently the greater capacity as claimed above. I wish to remind those who, in their imagination, cannot come quite up to this standard of speed locking boats, that a lock of this kind can be operated as slowly as any other lock, and also the fact that they cannot grasp its possibilities, would not be good proof that the possibilities quoted are not there.

The steamer Charles A. Eddy, which was burned on Lake Huron, has been put in dry dock at Cleveland. She made a trip across Lake Erie under bond to protect her salvors. The steamer was badly burned in the forward end. It is claimed that the crew of the Fred A. Meyer stripped the Eddy of her movable property while towing her down through the rivers. No complaint has been made by the owners about this, but action will probably be taken when salvage claims are presented.

AROUND THE GREAT LAKES.

The steamer Bulgaria, recently released from Washington island, has arrived at Manitowoc for repairs.

The shoal near the Brown hoists at Lorain, will be removed by Major Townsend, government engineer.

Horace E. Runnels, of Port Huron, has sold the barge Emma Tyson to S. C. McLouth, of Marine City.

The employes of the American Ship Building Co.'s plant at Bay City, held their first annual outing at Tawas Beach last week.

The fourth annual convention of the International Association of Passenger Steamer Stewards, will be held in Buffalo, Feb. 5 to 7.

The Dunbar & Sullivan Wrecking Co. were the lowest bidders for dredging section 3 along the Bois Blanc ranges in lower Detroit river.

The steamer Joshua Rhodes, commanded by Capt. Thomas Simons, left Lorain on her maiden trip on Thursday last. She took a cargo of coal to Lake Superior.

Capt. W. S. Shaw, who was master of the steamer Gov. Smith, which was sunk by the steamer Uranus, has been appointed shore captain of the Rutland Transit Co.

The steamer Falcon, bound to Escanaba from Boyne City with a cargo of iron ore, ran ashore three miles north of Charlevoix during a dense fog last week.

The steamer E. Y. Townsend, the first of the two Cambria Steel Co.'s steamers to go into commission, is coming down the lakes at present with 10,903 tons of ore on her maiden trip.

The tug Balize, of the Charlton Lumber Co.'s fleet sank recently in little Detroit passage. The Balize refused to answer her helm and ran aground, filling rapidly and rolled over into deep water.

Napoleon Grignon, vice president of the Duluth-Superior Dredge Co., succeeded last week in raising the tug Alfred W., which sank in 70 ft. of water off Pie island near Port Arthur, Ont., last fall.

Clemuel Cook, watchman on the steamer Michigan this season, occupied the same position on the Angeline last year. He hails from Marine City and is one of the boys who fits out and lays up a boat.

The Canadian steamer Rosemount, coal laden for Fort William, is on the rocks about twelve miles below the Detour lighthouse. The steamer is three feet out and will have to lighter part of her cargo before she can be released. The accident was caused by the thick smoke from the forest fires.

The steamer Wm. E. Fitzgerald building at the Wyandotte yard of the American Ship Building Co. for the Chicago Navigation Co., will be launched at noon on Saturday.

Jos. F. Hayes, who was formerly connected with the Pittsburg Steamship Co.'s fleet, but who is now chief engineer for the Wolvin boats, was in Ashtabula last week. He went out on the steamer Geo. H. Peavey.

Capt. James Reid, of the Reid Wrecking Co., is preparing to recover the machinery of the steamer Sevona, which wreck he has purchased. The Sevona was wrecked on Sand island, Apostle group, about a year ago.

The crew of the steamer Greyhound and the White Star line management have been completely exonerated from blame for the stranding of that steamer near Sugar island on the night of Aug. 6 with 1,300 passengers.

The wooden package freighter Charles B. Hill, formerly the Anchor liner Delaware, has been sold by the Great Lakes Engineering Works. The steamer is now being fitted out at the Ecorse yard for package freight trade.

Henry Beatty, second mate on the steamer Michigan, was on the steamer Frank J. Hecker last year. He has only had a license three seasons and he celebrated his promotion to his present berth by getting married at Marine City last winter.

The Great Northern railway has libeled the steamer Troy, of the Western Transit Co.'s fleet, for $15,000 for damage by that vessel to the Interstate drawbridge in Duluth-Superior harbor last month. The Western Transit Co. furnished bonds and the steamer was not delayed.

Recently Capt. J. J. H. Brown and T. T. Morford, of Buffalo, entertained David Vance, of D. Vance & Co., shippers, of Milwaukee, Wis., and Capt. A. B. Davis, retired. Capt. Davis was connected with the revenue service for forty-four years, being placed on the retired list a short time ago.

Capt. A. C. Callam, master of the steamer E. M. Peck, will bring out the steamer W. E. Fitzgerald, which is building at the Wyandotte yard of the American Ship Building Co. and which will be launched some time during the present month. Mr. Frank Keating will be her chief engineer.

While entering the port of Conneaut last week, the steamer Sahara

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ran into the western end of the east breakwater, causing considerable damage both to the breakwater and to herself. Two 50-ft. concrete sections of the breakwater were displaced several feet while two more were badly cracked.

The Upper Mississippi River Improvement Association will hold a convention at Minneapolis, Oct. 9 and 10. The headquarters of the association will be at the Nicolette hotel. Thomas Wilkinson, Burlington, Iowa, is president of the association and Louis B. Boswell, Quincy, Ill., is secretary.

Capt. G. A. Symes, master of the steamer James Laughlin, took his boat up through the Portage, Aug. 17, going light to Duluth. So far as is known, this is the first time a 552-ft. boat ever went through there. Edward Bennett and Harry Mitchell are the first and second mates on the Laughlin.

President Alexander McVittie of the Toledo Ship Building Co. announced this week that the United States Transportation Co. had given contract to his yard for two 10,000-ton freighters. The exact dimensions of the steamers have not as yet been determined upon, but they will be about 550 ft. long. Work will be begun upon them next spring.

Superintendent Franchot, of the state department of public works of New York, has reported that with the exception of 1903, the present season on the Erie canal was the most prosperous in several years. The total tonnage carried up to Sept. 1 was 1,987,218 tons as against 1,736,397 tons for the same period last year.

It is announced that Mr. Antonio C. Pessano, president of the Great Lakes Engineering Works, has closed contract with eastern parties for a freighter for 1908 delivery. The new steamer is to be 500 ft. over all, 480 ft. keel, 54 ft. beam and 30 ft. deep, and is to have triple-expansion engines, Scotch boilers, steel hatch covers and self-stowing anchors.

The steamer John Duncan, which was in collision with the steamer Lehigh on June 8 and sank in 50 ft. of water at Northport, Mich., was floated last week by Capt. Alex Cunning, of the wrecking tug Favorite, belonging to the Great Lakes Towing Co.'s fleet. The officials of the towing company are much pleased with Capt. Cunning's work.

Capt. Fred. D. Galton, who is master of the steamer Moses Taylor, is famed around the lakes as a raconteur, but it is doubtful if he ever excelled himself when he shaped a course in the Holden from Whitefish to Duluth without once shifting. One of his friends who repeated the statement says Capt. Fred allowed the leeway and heavy seas to haul his boat round.

President Livingstone, of the Lake Carriers' Association, has written a letter to Mr. W. H. Becker, of Cleveland, manager of the steamer B. F. Jones, thanking him for placing the steamer at the disposal of the United States engineer in connection with the opening of the new channel at St. Clair flats. Mr. Livingstone complimented Capt. C. M. Ennes, master of the Jones, for his services upon the occasion.

The C. S. Boone Dredging Co. began work on the last contract in connection with the improvements to the upper entrance to the Canadian ship canal at Sault Ste. Marie. This work involves the widening of the channel at the Vidal shoals, which are located near the junction of the channels leading from the American and Canadian canals. With the completion of this work the upper channel entrance to the canal will have a uniform width of 500 ft.

Capt. P. A. Peterson, master of the Pathfinder, made a trip to Ashtabula last week. His boat is probably fitted out more comfortably than any other whaleback on the lakes, and in view of the fact that she has made twelve trips this season with the barge Saginaw in tow, she is undoubtedly in it with the others for power and speed. Hiram Eldred and A. B. Bailey are first and second mates on her, while Henry Woods and John M. Green are chief and second engineers.

Capt. William J. Leaver, of Toledo, who commanded the D. W. Rust, was killed by the Pittsburg flyer of the Buffalo, Rochester & Pittsburg railroad, on the bridge at Buffalo creek at night recently. Capt. Leaver was taking a short cut to the Lehigh valley docks, where his boat, laden with ore, was moored. He was 60 years old and widely known in marine circles. H. A. Cuthbert was sworn in as captain of the D. W. Rust to succeed the late Capt. Leaver.

Navigation through the American canal at Sault Ste. Marie was delayed for three hours on Tuesday afternoon, when the downbound steamer Perkins, with a beam of 56 ft., and the upbound steamer Steinbrenner, with a beam of 50 ft., tried to pass in the narrows, where the channel is exactly 106 ft. wide. The fender strake of the Steinbrenner fastened in such a manner as to wedge the two boats together. Three tugs finally succeeded in towing them down the stream together until a wider place in the channel was reached.

The first book of a series of sailing directions for the great lakes, No. 108 A. "Lake Superior and St. Mary's River," has been thoroughly revised and rewritten by the United States hydrographic office and is now on the press. It contains all the latest information regarding these waters and orders for it may be filed with the MARINE REVIEW. No. 108 B, entitled "Lake Michigan, Green Bay and the Straits of Mackinaw," is also under revision. This and two other books will follow as fast as practical. The hydrographic office has long felt the need of revising these sailing directions for the great lakes, but has been unable until recently to begin this important work.

FREIGHT SITUATION.

To Sept. 1 of the present year, 22,721,095 gross tons of ore were moved, as against 21,048,056 tons during 1905, a gain of 1,673,039 tons. In order to move 36,000,000 tons, which has been fixed as the conservative movement for the year, the fleet will have to move between Sept. 1 and the close of navigation, 13,278,905 tons. As ore is slow in reaching upper lake ports and equally slow in leaving lower lake ports, owing to shortage of cars, it is not expected that the fleet will handle 13,278,905 tons during the balance of the year. The fall months are always accompanied by a lessened movement, owing to physical conditions. Stages of water are lower, storms are more frequent, and there are numerous other impediments to navigation, while on land, railways are compelled during the fall months to divert cars to other trades, owing to the general increase in business. Ships are necessarily delayed in loading cargoes and in unloading them. There is no change in the ore rate and the coal market is steady. Wild boats in the coal trade are quite plentiful, but the trade is in a general sense taking care of them. No advance in the coal rate is noted.

Mr. Charles McIntosh, who has sailed the lakes for over fifty years, died at Detroit this week. His last command was the side-wheel steamer City of Chicago of the Graham & Morton line, running between Chicago and St. Joseph. Capt. McIntosh was seventy-seven years old. Two of his sons are in the lake trade, Capt. John L. McIntosh, commanding the steamer John F. Eddy, and Capt. Murray G. McIntosh, commanding the steamer Admiral.

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THE DECLINE OF OUR SHIPPING.

BY D. A. TOMPKINS.

In the early days of the republic, the people of the United States developed a sea-going commerce which at that time would have been a credit to any nation. The young nation's commerce grew to a point where she carried in ships built in the United States, sailed under the American flag, and manned by American seamen, about 90 per cent of all the exports and imports of this country. This splendid development was made in the face of some most adverse influences. While England had acknowledged the independence of the United States as a nation, she still took every opportunity to harass the new nation wherever she could. England had a war with France, and during that war her navy caught and confiscated many American vessels, making as an excuse that these vessels were helping the French, either by means of carrying them supplies or otherwise. In many cases she would press the American seamen into the English naval or marine service, on the claim that they were English citizens. It was natural in that early day that a large number of American citizens should have been those who were born in England. England claimed every English-born person as an English subject. Piracy was more or less common in that time. Some nations cooperated with pirates in a winking way and permitted vessels to sail their flag as a protection, while in reality they were pirates, dividing spoils with officers of the nations under whose flags they operated. Spain did quite a little of this sort of collusive work with the pirates. But the United States created some fostering influences for her shipping to offset these adverse influences. She made laws giving to her own ships preferential duties which means that she charged all foreign vessels full import tariffs and allowed on goods arriving in American vessels, 10 per cent reduction off the current import duties. In addition to this she laid a tax per ton on all goods exported in foreign vessels and laid no tax on goods exported in American vessels.

The shipping business in the United States steadily increased even against the risks of the sea as to confiscation by the French and English, for they both confiscated American vessels; and against the dangers of piracy. The ships built in America at that time, which were all of wood and operated by sail, were as good as any built in the world. American seafaring commerce prospered until American ships carried 90 per cent of goods exported from, and imported into the United States. The American flag was ubiquitous on all seas and in all climes. The troubles encountered by American commerce at sea was the largest influence of bringing on the war of 1812. When peace was concluded, besides the treaty of peace there was a commercial treaty entered into in accordance with which England and America mutually agreed to consider the open seas as being neutral ground for their respective commercial vessels, and that as between the two countries, neither would handicap the commerce of the other. England was not to make preferential duties against America, nor was America to make preferential duties against the English ship. England reserved the right in the treaty to handle the commerce with her colonies as she pleased and practically outside of the treaty. At that time, in view of the harrassments to which American ships had been submitted at sea, it looked as though the arrangement was a very good one.

SHIP TIMBER ABUNDANT.

At that time ship timber was abundant all along the Atlantic coast. England was beginning to have to import ship timber either from the United States or elsewhere. At that time American ship carpenters and ship builders were as skillful as any in the world. There was not the unequal wages between America and England that there are now. All the United States lay immediately on the Atlantic coast, and it was more essential to do a deep-sea commerce than is appreciated in most parts of the United States today. The treaty with England naturally covered many other points besides this one upon the subject of sea-going commerce. It is generally considered today, and in the light of modern conditions, that this agreement handicaps us. There are those who say that this is an agreement by which the United States is forbidden to do anything to protect her deep sea shipping. Since making this treaty with England the United States has made treaties with a great number of other countries, possibly as many as 70, in which the so-called "favored nation" clause is inserted. This means that the nation with which the agreement is being made will not only enjoy all the privileges specified in the particular agreement, but if on any particular point any other nation is more favored than the country with which the agreement is being made, it will be equally favored. For instance, in the matter of treaty with Germany say, the understanding is under the most "favored nation" clause that if England has any advantage on any point, Germany is to have a similar advantage, whether it is mentioned in the particular treaty or not. Therefore of our treaties all treaty nations claim the privileges of having no preferential duty made against them. By this means the hands of America are tied in respect to making preferential duties unless our treaty with England be first repealed. It is easy to repeal because a certain notice is all that is necessary. But then, while it loosens our hands on the preferential duty item, it opens up every other point of treaty agreement between us, and practically every other nation in the world. We would have to start anew and make new treaties and there is no telling, whether in the end we would not fare worse than by trying to remedy this deficiency in the shipping business in some other way than by breaking up and opening up of our treaties. Many think that there are too many other points to these treaties working entirely satisfactory to us to justify undoing the whole treaty business because of our shipping, if it can possibly be avoided.

A NATION WELL FIXED.

From 1815 to say 1835 our shipping did not suffer materially because we were as well fixed as any other nation to build ships. We were as well fixed as any other nation to sail ships, and we got the real benefits of being free from the harrassments of English and French depredations and naturally in the course of events we were freed from the piratical depredations also. But as America became more prosperous at home and as steel and steam came in to be the main features of a ship, America began to get behind. We were better fixed than England to build a wooden ship, and to sail a ship as well or better than the English, (we do it yet in yacht races) but England developed the business of building steel ships driven by steam in advance of us. By the time the civil war came on the American merchant marine had entered upon a decline. This was due to three or four influences.

(1) England was ahead of us in the building of steel and steam ships.

(2) Prices of American labor had materially advanced so that the operations of an American ship had become more expensive than those of England.

This decline was tremendously hastened by the breaking out of the civil war. During the war every vessel on the ocean practically became a war vessel. American commerce was totally neglected, many of the ships were sunk, or otherwise destroyed during the war, and by the end of the war there was nothing left of American deep sea commerce.

CRIPPLED BY WAR.

To this day it has not revived again. When the civil war ended we had a crippled and old-fashioned navy. Im-

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mediately after the war, both the navy and merchant marine were totally neglected. American wages had gone out of sight during the war. Wooden ships had become out of vogue. We were not skillful at making iron and could not make steel at all, and England was so far ahead of us that without some kind of preference, we could not hope to catch up. Domestic trade and transportation were so good that people did not think much about the lost marine service. In this situation the coast trade being part of domestic trade was fully protected and reserved for Americans. The trade on the lakes was likewise reserved for the Americans, but the navy and deep sea trade was allowed to go.

During one of Mr. Cleveland's administrations, and by his direction, Mr. Wm. C. Whitney, then secretary of the navy, undertook to reorganize and reconstruct the American navy. The success which came of this effort is attested by the success of the navy in the Spanish war. This beginning was made after a lapse of 25 or 30 years during which period we practically had no navy at all. Today we have one of the respectable navies of the world and none can doubt but that the people are not only satisfied, but gratified that the money has been spent and that we have got the navy. It transpires that the merchant marine is still practically dead. From a position, along about 1825-30, of having a merchant marine which handled over 90 per cent of all our exports and imports, we have fallen, in a time otherwise far more prosperous, to a condition that we handle less than 10 per cent of all our imports and exports. Meanwhile the coastwise trade, which is reserved for America, is most prosperous, and the lake navigation, which is also reserved, is the most prosperous water transportation in the world. It seems strange that we should have developed domestic and internal waterways to where they are the best in the world, and yet on the deep seas we occupy the lowest position.

The failure to remedy this difficulty is not because the subject has received no attention. It is not wholly because of indifference, at least in so far as the students of the subject are concerned. It is mostly because those who would formulate plans for the remedy cannot agree. There are those who believe it would be advantageous to give notice and abrogate the treaties, and then adopt the old plan of preferential duties and tonnage taxes. There are others who believe that it would be best not to disturb the treaties, because if England has found ways to get advantage of us under the treaty, there is no reason why we should not find ways to at least get equal advantage under the treaty alone. The plan by which England and other countries have chiefly gotten advantage of us, without violating the treaty, is to find excuses for paying their ship owners that we call subsidies. There is no provision to forbid any nation maintaining at her own cost a naval reserve, including ships and men. There is nothing to forbid a nation paying ships for carrying the mail. England pays to many of her ships what she calls admiralty subventions. This is a sum of money paid to a ship, provided it will enlist in the English naval reserve. It is precisely the same thing that our government does in maintaining a naval reserve at points in the United States. England pays a liberal annual sum to the ship owner for the right to call on the ship in case of war for use as a transport, or a fighting vessel, if it is desired. England also pays the common seamen part of their wages, approximately $24 a year. She pays to the officers annual fees as high as $150 a year, and all these are maintained on the payroll of the navy and are considered a part of the navy. These payments by the government are gratuities over regular pay. The amount of an admiralty subvention may be as much or little as England desires to make it, and under the guise of admiralty subventions, considerable subsidies are often paid. The same is true of mail compensation, and there are other items which are brought into the account for the purpose of giving the English ship an advantage over all other ships.

ENGLAND'S LIBERAL SUBSIDY.

The latest and most extravagant subsidy given by England is to the Cunard Steamship Co. England wants two trans-Atlantic steamers, superior to any in the world. She is stimulated in this ambition because Germany has lately built some very fine, large and high-speed ships. The government loans to the Cunard company $12,000,000 for the construction of two trans-Atlantic passenger and freight steamers to exceed in size and speed any vessels on the ocean. Our own best ships make 20 knots per hour. Germany's latest ships make 23 knots per hour. The new Cunards must make 24 knots per hour. These two ships are to cost $6,000,000 each. The interest rate charged by the government on the entire loan is two per cent. The admiralty subventions, mail contracts and other payments to be made by the English government are sufficient to make the annual payments back on the principal and the interest as well. Therefore at the expiration of the time the Cunard company will own these two ships without having invested a penny of capital in them or paid a penny of interest money. All the company has to do is to own and operate these ships for what money it can make out of them. Meanwhile the English government considers that it is in a strong position both as to commerce and war if it has ships that make quicker deliveries and carry more passengers and freight and make the passengers more comfortable than any other ships in the world.

Besides the two plans of the preferential duties with tonnage taxes, and the plan for naval subventions and mail contracts, there are some other plans. It has been suggested that the trunk lines of railway build and own ships to be operated on the deep seas, and that they make a through rate say from Memphis, Tenn., to Manchester, England that would be cheaper than any combined rate with a foreign vessel and charge the cost proportionately to the ship and the railroad. This means a combination of railway and deep sea ship interests, and it means that the deep sea interest must be maintained at the cost of the railway interest. In the end the people would have to pay the deficiency to the railroad in the shape of high local rates, and it practically becomes the equivalent of a subsidy in the end. Besides this it would tend to build a giant domestic and ocean monopoly in traffic, which would probably be more unsatisfactory than the subsidy plan.

It seems to be generally conceded that the preferential duty and tonnage tax plan would be the best except for disturbing so many treaty arrangements. The merchant marine commission took testimony covering the whole field of the American merchant marine.

The majority of the commission reported in favor of leaving all our treaty relations undisturbed and by entering into the competition of paying admiralty subventions, mail carriage, and other similar charges including in these charges any subsidy beyond the real value sufficient to equalize American conditions with those of the foreign countries.

A minority of this commission recommended the abrogation of the treaties and the adoption of preferential duties and tonnage taxes.

There is still an element who argue that if England and Germany are willing to subsidize their ships, making cheaper transportation than can be ordinarily furnished, why not take advantage of the cheapness and let them carry our goods. This is letting the consideration of a detail overshadow the main question, as follows:

England and Germany pay approximately $17,000,000 in subsidy. This gives their ships just enough advantage to practically monopolize the American carrying trade and while paying out

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$17,000,000 they collect back $200,000,000 or $300,000,000. It will be evident they not only keep the $17,000,000 in their own country, but they get an enormous flow of money from our country to theirs for ocean traffic. It has been said that England has as much income per year from her ships as the total value of the American wheat crop is to this country.

Then in the case of war we are compelled to have transports. With a large naval reserve, including the best ships of the merchant marine and a full equipment of men and officers in the merchant marine, we are always splendidly prepared for war. In the late war with Spain, the United States spent enough money buying transports to pay all the subsidies that would be required for a number of years to come. In addition to this, what she got for the money is practically already gone, because what was available to be bought was mostly old hulks that were nearly worthless and in all cases inferior ships. Her main reliance was on those American merchant vessels which had been maintained by mail contracts which were practically subsidies.

Both the majority and minority of the marine commission concur that the condition of the American merchant marine is deplorable. That the remnant which is left is simply the dying remnant. That something ought to be done to revive it. That the people not only approve, but demand that something be done to revive it and that all that is necessary is to agree upon a feasible plan.

THE NECESSITY FOR REVIVAL.

The necessity for this revival is becoming daily more acute. Serious as the need of the navy is for transport vessels in the event of war, the production of American manufacturers has become so great that there is imperative need of foreign trade. The only possibility of properly developing this is to have American ships manned by American seamen and officers, who are interested in the extension of American commerce, go to the foreign ports and offer American goods from under the American flag in the foreign port. Here lies the most immediate and pressing need. If we can develop a domestic commerce by means of railways that exceeds that of any other nation in the world, surely we can develop a foreign trade by means of building and owning vessels that are capable of taking care of the surplus production by our factories. What sort of fix would our domestic trade be in if we permitted the English and German government to send engines and trains and crews over here to do a business on our railroads and sufficiently subsidized to justify them in underbidding our own railroads just enough to do the commerce. In addition to this if we let them send all the income from this traffic back home, we would then be in practically the same position with reference to our domestic commerce that we permit ourselves to be put in by the present situation on the high seas.

We are building the Panama canal at a cost of what will probably aggregate $200,000,000. Unless we can change our present shipping situation this canal will be for the use of English and German ships in peace and either nation might take it away from us in war, because war with either or both would find us without transports to serve our navy or carry our army to the fighting ground.

The stimulating influence necessary to rehabilitate our merchant marine, whether by the plan of preferential duties or by the plan of making the ships part of the navy reserve and by mail contracts, would not need to be indefinitely continued.

SHIPPING ON THE LAKES.

The shipping on the lakes reserved for American use only, has attained a position against which no foreign country could now compete, if the field was made open. I have not verified the statement that has been made to me, to wit, that our lake tonnage is greater than the aggregate deep sea tonnage of the world, and the freight charges less. Whether this is true or not, the development of shipping on the lakes shows that Americans can develop a shipping trade if given navigation. England has always practically pursued the policy of reserving English goods for English ships. Aside from payments in cash or loans, this policy alone carried out as England has adroitly carried it out is subvention with a vengeance.

Any measure that would constrain American goods to be carried in American ships would give a basis upon which our deep sea marine service might be not only brought parallel with that of foreign countries, but there would seem to be no valid reason to doubt that we might bring it to approximate the development of shipping on the lakes, and of our transportation on land by rail.

LAKE STEAMERS LAUNCHED.

Two more lake freighters were launched on Saturday last, the Henry A. Hawgood at the Cleveland yard of the American Ship Building Co., and the E. L. Wallace at the Ecorse yard of the Great Lakes Engineering Works. The Henry A. Hawgood is the last of three big steamers that were ordered by the late Henry A. Hawgood, the others being the Harvey D. Goulder and the J. Q. Riddle. Miss Helen A. Hawgood christened the vessel in honor of her father. The launching was successful in every way. The Hawgood is 552 ft. over all, 532 ft. keel, 56 ft. beam and 31 ft. deep. She will have thirty-two hatches spaced 12-ft. centers. Her engines are triple-expansion with cylinders 23½, 38 and 63 in. diameters by 42-in. stroke, supplied with steam from two Scotch boilers, 14½ ft. diameter by 11½ ft. long, fitted with Ellis & Eaves draft and allowed 180 lbs. pressure. The launch was witnessed by Miss Helen A. Hawgood, Mrs. Henry A. Hawgood, Miss Pocunier, Miss Thomas, Clark D. Adams, Sheldon Parks, Charles Stocker, H. Clark Gould, Thatcher Parks, Sheldon Parks Jr., Capt. and Mrs. Arthur H. Hawgood, Harvey Hawgood, Miss Aldyth Hawgood, H. B. Hawgood, Mr. and Mrs. Roy Ellis, Robert Wallace, O. J. Fish, O. N. Steele, and Miss Virginia Martin.

The steamer E. L. Wallace was christened by Miss May Hudson, of Fremont, O., and the launching was perfect in every way. The Wallace is 445 ft. over all, 420 ft. keel, 52 ft. beam and 28 ft. deep. She has twelve hatches spaced 24-ft. centers. Her engines are triple-expansion with cylinders 20, 33½ and 55 in. cylinder diameters by 42-in. stroke, supplied with steam from two Scotch boilers, 12 ft. nine inches by 12 ft., allowed 175 lbs. pressure. She will be operated by the Dearborn Transit Co. and will be commanded by Capt. John McAlpine. Her chief engineer will be John Genunhard. Those present on the launching stand were: Mrs. Hudson, wife of Dr. Robert A. Hudson, of Fremont, O.; Mrs. E. L. Wallace, Detroit, mother of the Wallace brothers, and in whose honor the steamer was christened; Mr. and Mrs. Eric Simpson, Chicago; James I. and Frank B. Wallace; Mr. and Mrs. Thomas T. Leete Jr.; Miss Lillian Leete; Miss Mary Leete; Mr. and Mrs. J. F. Duntley; D. M. Ireland and daughters, Misses Rose and Mamie, all of Detroit; and Mrs. Harper, of Chicago; Mrs. J. S. Keightley, Miss Emily Keightley, Capt. John McAlpine, John R. Russel, all of Detroit.

Walter Treleven, of Port Huron, one of the oldest marine engineers on the lakes, died at his home while sitting on the veranda talking with his son. Mr. Treleven was seventy-two years old and had been ill for about eight months.

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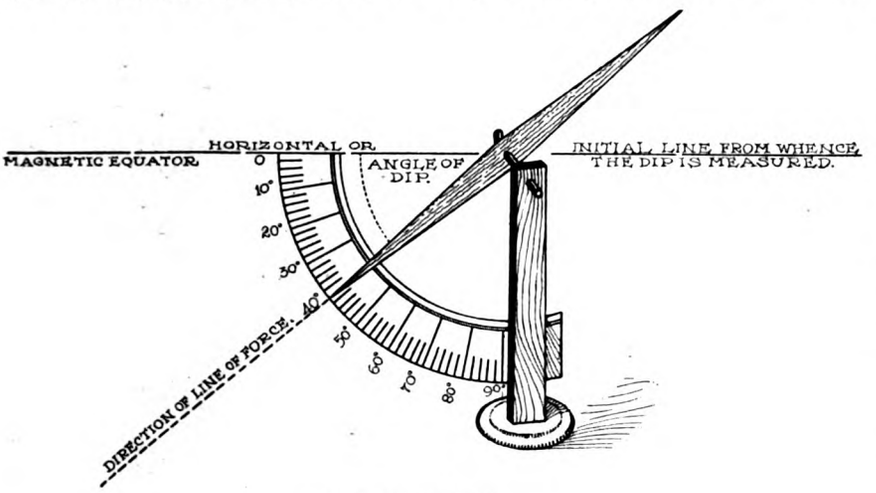
SCIENTIFIC LAKE NAVIGATION

By Clarence E. Long

DIPPING NEEDLE.

How the Dip is Measured.—To find the dip at any place, the instrument is set so that the vertical plane in which the needle moves is in the magnetic meridian. In other words, the magnetized needle is placed in the magnetic meridian, so that it is acted upon by the earth's



DIPPING NEEDLE.

total force, that is, the horizontal and vertical forces combined. The dipping needle is acted upon by the two forces of the earth whereas the compass needle is acted upon only by the earth's horizontal force. The dipping needle in the first place aligns itself in the magnetic meridian (it is then under the control of the horizontal force, or it may be considered that the magnetic poles have control of it), and in the second place it is acted upon by the earth's vertical force. This vertical force is not exactly vertical, but it is not horizontal. Fig. 23 explains this very thoroughly.

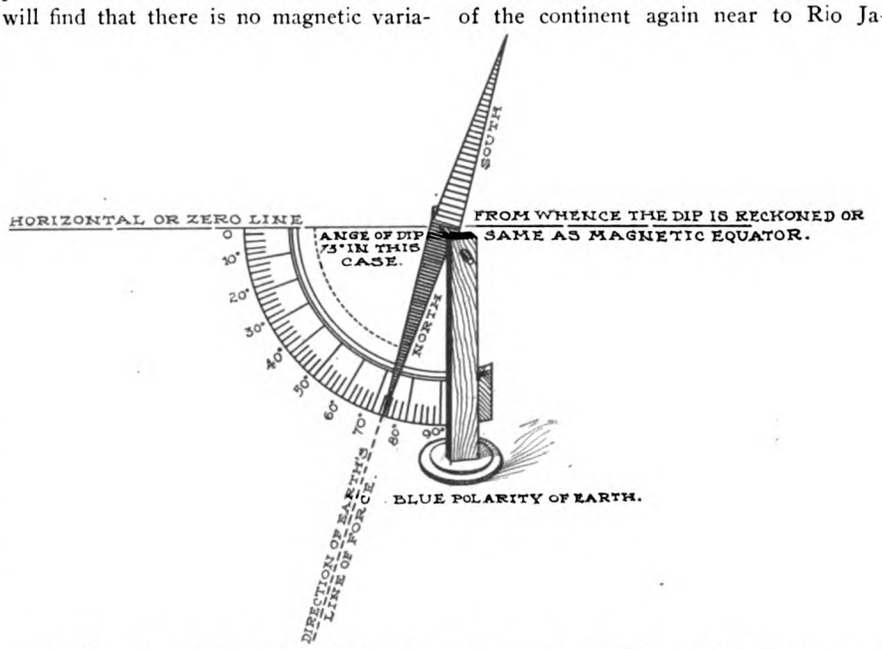
The dip, or inclination, is the angle the needle makes with a horizontal line, read in degrees upon the quadrant circle.

The dip, of course, varies in different places on the earth, and it is not uniform but very irregular in different latitudes; that is, it does not increase or decrease proportionately. A line running around the earth and connecting those places where there is no dip, is the magnetic equator.

As the magnetic pole toward which north on the compass points does not coincide with the end of the earth's axis, or true north, the compass needle does not everywhere indicate a true north and south line, and the angle this magnetic meridian makes with the true meridian at any place is called the "variation of the compass."

To simplify matters, the earth's magnetism which gives directive force to the needle may be assumed to be exclusively centered in the magnetic poles, and the needle pointing thereto. Now, it will be readily seen by referring to the chartlet of the magnetic poles, that there are only certain places on the earth's surface where the true and magnetic poles can be brought in line, or are in transit with each other. If so situated at any place on one of these lines the observer will find that there is no magnetic variation, consequently there will be none to allow for by the navigator. The needle continues to point to the magnetic poles just the same as ever, but as the true poles coincide with the magnetic poles, hence there can be no variation, because there is no angle included between the magnetic and true meridians. The student may trace this line of no variation on the chartlet. Imaginary lines passing through all these points on the earth's surface where the needle points true north and south are called lines of no variation, technically known as agonic lines.

There are two principal lines of no variation, and their configuration, if traced on an isogonic chart of the world would be about as follows: The western line traverses the continent of America and the Atlantic ocean in a northwesterly and southeasterly direction. Commencing in the polar sea, about Port Kennedy, say in about Lat. 75° N. and Long. 100° W., its course has been traced down through Hudson bay, through the east portion of Lake Superior, across the northerly end of Lake Michigan, thence down through central Michigan and Ohio, until it leaves the Atlantic coast near Charleston. It then traverses a portion of the Atlantic ocean to the eastward of the West Indies until it meets the continent of South America at Georgetown. Proceeding thence in a southeasterly direction, it cuts the shores of the continent again near to Rio Janeiro, between 40° and 45° W. Long., and enters the South Atlantic, where it pursues the same direction as before, and can be traced toward the south mag-


SOUTH
HORIZONTAL OR ZERO LINE
FROM WHENCE THE DIP IS RECKONED OR SAME AS MAGNETIC EQUATOR.
ANGE OF DIP 73° IN THIS CASE.
NORTH
BLUE POLARITY OF EARTH.
DIRECTION OF EARTH'S LINE OF FORCE.

Showing action of dipping needle in the north magnetic hemisphere, which contains south magnetism, or blue polarity. The blue polarity of the earth's magnetism attracts the red or north end of the dipping needle. To show these effects to advantage color the needle red and blue. The lower half red, because it is the north pole of the needle, and the upper half blue, because it is the south end of the magnetized needle. Also, color the shaded portion representing the earth, blue, or that portion where it reads "blue polarity of earth."

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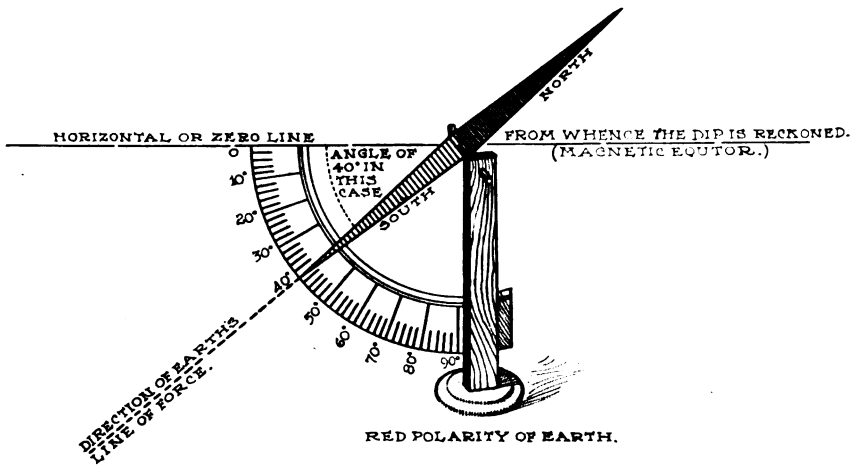
netic pole as far as Lat. 60° S. The course of this line presents but little inflection, and is inclined to the meridian nearly at the same angle throughout. The eastern line of no variation follows, for the most part, a similar direction. It traverses European Russia from the White sea to the Caspian, and enters the Arabian sea in about Long. 65° E. It then pursues the same general direction in the Indian ocean as far as Lat. 8° S. and Long. 90° to 100° E. To the eastward of this it bends again southward, intersects the north coast of Australia in about Long. 125° E., and finally emerges and enters the great Australian Bight in about Long. 130° E.



Showing action of dipping needle in the south magnetic hemisphere, which contains north magnetism. The red polarity of the earth's magnetism attracts the blue or south pole of the dipping needle, hence that end of the needle inclined toward the earth is the south pole of the magnetized needle. The coloring wants to be the reverse of the needle in the northern hemisphere.

There is, however, in the eastern part of Asia and the adjoining sea, a closed curve of no variation. This remarkable loop, inclosing part of Siberia and of the Chinese Empire, has the form of an oval, whose greater axis lies nearly in the meridian of 130° E. Long. The diameter of the oval extends from 20° to 70° N. Lat. and Long. 105° to 150° E., inclosing therefore, Japan and part of China, Manchuria, and Siberia. It is almost certain that there is a similar but smaller loop agonic line just south of the equator, and between 120° and 130° W. Long.

ISOGONIC LINES, OR LINES OF EQUAL VARIATION.

These are lines connecting all points where the magnetic needle is deflected from the geographical meridian by an equal quantity. These are extremely irregular curves, and from two closed systems, surrounding two points which may be called centers of variation. One of these points is in eastern Siberia, the other in the Pacific ocean, in the vicinity of Marquessa.

In the space between the two agonic lines—to the east of the former and to the west of the latter—the variation, or declination, is westerly. This space includes the eastern part of America, the Atlantic ocean, nearly the whole of Europe, and the whole of Africa. In the remaining division of the globe—to the west of the former, and to the east of the latter—including the Pacific ocean—and the greater part of Asia and America, the variation for the most part is easterly.

The point of the equator at which the westerly variation is greatest is in the Atlantic ocean, to the south of the Bight of Benin, nearly in the meridian of Greenwich. There are two points of greatest easterly variation, with an intervening minimum. These three points are all in the Pacific ocean.

If we, in like manner, follow the line of needles which have all, say, 5° Wly. Var. we pursue an isogonic line; these run nearly parallel with the agonic. But the greater the angle of variation on the isogonic, the more does it depart from parallelism with the agonic; and this, whether the variation is easterly or westerly, until the isogonics cease to cross the equator. These agonic and isogonic lines are continually shifting slightly through the day and seasons, and altering through the centuries. This data is given on all navigational charts; it comprises principally the amount and direction of the variation, and the number of minutes and seconds of arc it is increasing or decreasing annually. The date of issue of the chart is also given so that it becomes an easy matter to allow for the change, no matter how old the chart may be. Westerly variations are increasing and easterly variations are decreasing.

THE DIRECTION IN THE VERTICAL PLANE, INCLINATION OR DIP.

As we have already seen, if before magnetizing a needle, we mount it on an axis, passing through its center of gravity and support the end of the axis, by a thread, the needle will remain in equilibrium in any position it may be placed. If it be then magnetized and suspended as before, and free to assume any direction it will no longer remain in equilibrium, but either one or the other of its poles will be attracted downwards, depending on which part of the earth's surface the observation is made. If in the north magnetic hemisphere, that is, north of the magnetic equator, the north, or red end of the needle, will be attracted downwards and towards the north, because there is blue polarity in this portion of the earth, and the angle of inclination will be somewhere between a horizontal and a vertical line (something less than 90°) or zero on the magnetic equator, and 90° at the magnetic poles. If in the southern magnetic hemisphere, the south or blue end of the needle will be attracted downwards, or towards the earth, because there is red polarity in that portion of the earth. The dipping needle will always take up its direction in the magnetic meridian, if permitted to do so.

Definition of Dip or Inclination.—The angle included between a horizontal plane and the axis of a magnetic needle when allowed to come freely to a state of rest (i. e., when the vertical plane in which it moves coincides with the magnetic meridian). A line through the poles of the needle at that time is called the earth's line of force at that place. At the two magnetic poles, or rather linear spaces on the earth's surface, where these poles are located, the needle assumes a vertical position, or the dip is 90°. At the north magnetic pole the red end of the needle dips and at the south magnetic pole the blue end of the needle dips.

A dipping needle is a magnetized needle, moving in a vertical plane, or an axis which passes at right angles exactly through the center of gravity. When thus mounted it will, if placed anywhere but on the magnetic equator, dip or point downwards. The position of the magnetic pole can thus be determined from the intersection of two or more lines formed by making experiments with the dipping needle at various places. The inclination or dip of the magnetized needle was not known to the Chinese, who had discovered its variation in the twelfth century. This element of terrestrial magnetism appears to have been discovered by Robert Norman, a compass maker of London, who detected the dip, and published the fact in 1576. He contrived the dipping needle, and found the dip at London to be 71° 50′. Captain Sir James Ross, the celebrated Arctic navigator, reached the magnetic north pole, Lat. 70° 5′ N. and Long. 96° 47′ W. on the first of June, 1831. The amount of dip lacked a few minutes of 90°.

Captain Ross could not discover a

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spot (and there is probably none) where the dipping needle pointed vertically downwards, or where the inclination was 90°. He cruised in the vicinity of the pole for days and days without success, and he finally named that spot, where the dipping needle showed the greatest inclination, the north magnetic pole. This, the student will see is not in accordance with the well-defined laws of the science, as we are told that at the magnetic poles the dip is 90°. These little deflections from the truth should not be considered by the student. It is well to know them but they should count for nothing in practice, as they really have no value.

That the fundamental principles of magnetism are based upon well-defined and established laws and theories is made all the more apparent by the experimental study of the science. The student cannot help but notice the perfect harmony that exists in the relationship of one law upon another of this interesting science. By experiments all theoretical laws can be practically applied, even where these laws have no existence, as has already been enumerated.

It must be remembered by the student that the fundamental principles of the science are always simple and are generally to be illustrated by very simple experiments, but that these fundamental principles are constant in their action and that therefore they apparently interfere with one another.

A dip circle is a vertical graduated circle (cut to degrees) in the plane of which a delicate magnetic needle is suspended on a horizontal axis, which rests upon two polished agate supports. The circle is set in the plane of the magnetic meridian, and the needle indicates upon the graduated circle the angle, or amount, of the inclination. The graduated arc attached measures the angle the needle makes with the horizon.

MAGNETIC EQUATOR, OR ACLINIC LINE.

The line which joins all places on the earth where there is no dip; that is, all places in which the dipping needle is quite horizontal. This line which is not a great circle does not coincide with the geographical or terrestrial equator, which it crosses in two points almost exactly opposite and never recedes from it on either side farther than 15°. Its situation slowly alters year by year, due to the slow oscillation of the magnetic poles, whilst the geographical equator and poles are fixed. The two points in which the magnetic equator cuts the horizon are at present traveling from E. to W.

MAGNETIC CHARACTER OF THE EARTH EXPLAINED BY A MAGNET.

A striking similarity exists between the character of the earth and that of an artificial magnet. Having provided a little unspun silk, by means of a bit of wax, or otherwise, attach the silk fibre to the magnetic needle. Place a bar magnet on the table and hold the needle over the equator (marked X in illustration) of the magnet. The needle sets horizontal, or comes to rest in a position of parallelism to the bar, and its N. pole pointing to the south pole of the bar—being acted on equally at its opposite ends by equal forces of attraction and repulsion. Move the needle towards the south (blue) end of the magnet, the north (red) end of the needle dips, the dip augmenting as the south pole is approached, over which the needle, if free to move, will set exactly vertical. Move it back to the center, it resumes horizontality; pass it towards the north (red) pole, its south (blue) end now dips, and directly over the needle becomes vertical, its south end being turned downwards. Hence, if we suppose a series of small magnets to be suspended above a large bar magnet, as shown in Fig. 23, they assume the respective positions therein indicated.

Thus we learn that on one side of the magnetic equator the north end of the needle dips, on the other side the south end dips, the dip varying from nothing to 90°.

Imagine now that the bar magnet represents a portion of the earth's surface extending along a given magnetic meridian between the magnetic pole of the northern hemishpere, and that of the southern hemisphere, and we have an exact image of the way in which a needle freely suspended from its center of gravity is acted upon when carried from magnetic pole to magnetic pole. If we go to the equatorial regions with a suitably suspended needle we should find the position of the needle horizontal. If we sail north the N-seeking end (red pole) of the needle dips, and if we sail south, from the equator, the opposite end (blue pole) of the needle dips, and over the north magnetic pole, the N-seeking end, or red pole, of the needle points vertically downwards, or as near to it as can be measured; similarly at the magnetic pole of the southern hemisphere, the needle stands vertically, but with the S-seeking end, or blue pole, downwards. At the magnetic pole the declination needle is, of course, at rest in any position.

ISOCLINIC LINES, OR LINES OF EQUAL DIP.

Lines connecting places in which the dipping needle makes the same angles with the horizon are called lines of equal inclination, or dip; technically known as isoclinic lines.

These lines, in their general configuration resemble closely the magnetic parallels referred to. Within the tropics they are slightly inclined to the equator; the flexures increase with the latitude, and in the higher latitudes they tend to form closed curves, encompassing the points at which the inclination was 90°, or the needle assumes the vertical position. Near to the magnetic poles the curves are oval, or rather pear-shaped; but the major axis of the northern curves and those of the southern curves are not in the same direction.

It will be seen from this that the increase of dip is nearly double of the increase of latitude.

EASTERLY AND WESTERLY ON THE COMPASS.

Query.—MARINE REVIEW—"Ask Mr. Long what he means by the question. 'Starting from E on the compass, where would two points easterly fetch you?' Would it be E ½ S?"

A SAILOR.

Answer.—Two points easterly (easterly means to the right) of east is the same thing as two points to the right of east, or ESE.

The terms "easterly" and "westerly" as used in navigation have an altogether different meaning than these same terms when used in their literal sense, or even when used figuratively.

The dictionary defines "easterly" as "situated, moving or directed, toward the east, eastward; as an easterly current; the easterly side of a house. Coming from the east, as an easterly breeze, etc."

In navigation easterly does not mean east, toward the east or from the east. Easterly on the compass means to the right continuously from any degree or point on the compass card, or simply to the right. To make an easterly circuit of the compass card you would move continuously to the right. If you started from north you would move to east, from east to south, from south to west and from west to north. If you started from east you would go to south, thence west, thence north and thence east. If you started from south, you would go to west, thence north, east and back to south.

Westerly means to the left continuously from any degree or point on the compass card, or simply to the left,

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as from north to west, west to south, south to east and east to north. Four points westerly (to the left) of north is west; four points westerly (to the left) of east is north; two points westerly (to the left) of south is SSE; five points westerly (to the left) of west is S by E, etc. Westerly simply means to the *left.*

Four points easterly (to the right) of north is east; five points easterly (to the right) of east is S by W; six points easterly (to the right) of south is WSW; two points easterly (to the right) of WSW is west.

Easterly is in the direction that the hands of a clock revolve, that is to the right, and westerly is in the opposite direction that the hands of a clock revolve, or to the left.

If easterly and westerly are taken literally such expressions as "two points easterly of east;" "which way is westerly from east?" "four points westerly from west;" "which way on the compass card would you move to go easterly from west?" would be both illogical and therefore meaningless. Thus, these terms as used on the compass in conjunction with variation and deviation and in the conversion of courses, admit of a qualifying term recognized only by navigators; hence the importance of giving these terms this additional meaning.

This additional meaning no doubt originated in naming variation and deviation easterly and westerly. Variation is easterly when the magnet needle is drawn to the right of the true meridian in pointing to the magnetic poles of the earth, which everywhere do not coincide with the true poles or true meridian. Not only the north end of the needle but the south end as well, since the needle has two ends, and while one end points northward the other, of course, points southward. If the north end of the needle when pulled to the right is easterly, then too, the south end of the needle when drawn to the right must be easterly, too, and so it is. The same thing is true of westerly. Most writers define variation as being easterly when the north end of the needle is drawn toward east. This is very true when north is made the top of the compass, as is so often the case, but when south is made the top this definition does not hold good, and it is not only misleading but confusing as well. They forget that the needle has two ends, and that if one end is drawn aside the reverse end must be drawn in the same direction. There should be no top to the compass. You should imagine yourself situated at the center of the compass looking outward in all directions. You will find whichever course you are steering on to be the "top" of the compass, if top you can call it.

Easterly and westerly may be called directions; that is, easterly is in the direction of right, or toward the right. Westerly is in the direction of left, or toward the left. When one once understands the meaning of these terms as here defined the application of the variation and deviation to the true course or to the compass course will be easily and readily understood.

Two points easterly from east would be the same thing as two points to the right of east, or ESE. Merely substitute right for easterly and left for westerly, and you cannot make a mistake. Easterly from west would be to the right of west. Westerly from west would be to the left of west, etc. For additional information on this subject see page 28 of MARINE REVIEW, July 28.

LONG.

QUESTIONS FOR WHEELSMEN AND WATCHMEN.—NO. 10.

In giving a correction to Question 66 in the issue of Aug. 30, two lines were transposed which made the question meaningless. Question 66 Should be as follows.

"Going through South Passage coming from the eastward with South Bass island light in view and Green island shut in to the northward of South Bass island, what would you tell the wheelsman to do if in command of steamer?"

Give all shoals and principal landmarks passed on either hand.

102. What place between St. Clair ship canal and Canadian clubhouse where deep loaded vessels bound up should always take the one whistle side if it can be secured?

103. Tell how to navigate a boat from Canadian clubhouse to Marine City.

104. Tell how to navigate a boat from Marine City to abreast St. Clair by either channel.

105. Which channel is safest for deep draught boats to navigate?

106. Tell how to navigate a boat from head of Stag to Sarnia.

107. When Sarnia opens up, what is a good mark to steer on?

108. Tell how to navigate a boat from Sarnia to Lake Huron lightship.

109. What mark would you have stern of boat on and what would you head on from Sarnia crossing to the Port Huron side of river?

110. Meeting a boat in rapids if you were going out, which side would you consider the best to take?

111. When going down the river past Port Lampton, what good mark would you head on and what mark would you have stern of boat on to clear the shoal at head of Russell island?

QUESTIONS FOR OILERS AND WATERTENDERS.—NO. 6.

51. What is the meaning of the word vacuum?

52. How high would the temperature of the water in the boiler be, carrying 100 lbs. pressure, before it would boil? Would this temperature increase before boiling, should the steam rise to 250 lbs? If so, how much?

53. What is meant by the throw of the eccentric?

54. Give a good rule for finding the lap of a slide valve.

55. Give eight causes for an engine to thump or pound.

56. Suppose the throttle valve became deranged, how could you slip the engine?

57. What is meant by mean effective pressure?

58. What would be the mean effective pressure in a cylinder using steam at 65 lbs. per gauge and cutting off at one-quarter stroke.

59. Approximately how much condensing water is required for H. P. of engine?

60. How would you detect a condenser getting hot, and how would you prevent this occurring again after your attention had been called to it?

QUESTIONS FOR MASTERS AND MATES.—NO. 9.

131. What would be the effect were you to turn a suspended magnetic needle end for end, and then let go of it?

132. Tell how to make iron filings adhere to a bar of soft iron by the aid of a bar magnet.

133. Bring a piece of soft iron into contact with the pole of a bar magnet, and dip the end of the soft iron into iron filings. What is the result?

134. Remove the piece of soft iron from the magnet, and what is the effect?

135. What is a "magnetic chain?"

136. Explain how one can be made.

137. What kind of magnetism is this?

138. Explain how repulsion is possible to be converted into attraction?

139. What would be the effect if two magnets of unequal size be brought into contact with each other?

140. What would be the effect of two magnets of about the same size if their like poles were brought together?

141. What would be the effect if their

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unlike poles were brought together?

142. Explain why when a bar magnet is broken two magnets are formed.

143. What is induced magnetism?

144. What is the difference between permanent magnetism and induced magnetism?

145. What is meant by the variation needle?

OFFICIAL DETAILS ABOUT H. M. S. DREADNOUGHT.

The admiralty has issued a parliamentary paper giving details of the new construction for 1905-6, which were not included in the current navy estimates. The specially interesting feature of this paper is the fact that the detailed description is given about the Dreadnought, the ship about which there has been so much secrecy. The description goes far beyond what has formerly been given officially as to the ships of H. M. navy. The ship is 490 ft. long, 82 ft. beam, 26½ ft. draught, and with 900 tons of coal displaces 17,900 tons. The estimated power is 23,000, giving a speed at load draught of 21 knots. The total coal capacity is 2,700 tons, but provision is also made for oil fuel, the amount of which is not stated. The armor belt is 11 in. thick amidships, tapering to six inches forward and four inches aft. The redoubts vary in thickness from 11 in. to eight inches. There is a conning tower 11 in. thick, with an auxiliary conning tower eight inches thick, and the protective deck is 1¾ in. on the flat and 2¾ in. on the slope. No mention is made in this official account of any internal protection, but in a previous account (in an article in the *Fortnightly Review*) mention is made of internal armored bulkheads to protect the shell rooms and magazines from destruction by torpedo or mine. It is now confirmed that there are no doors in the main bulkheads below the main deck, and lifts are being provided to enable officers to get up and down quickly. As was evident at the launch, the ship has a fine freeboard forward, now stated at 28 ft., and this enables the ship to keep her speed at sea and also gives the forward pair of guns a fine command. The uniform armament of ten 12-in. guns is arranged in pairs, and there are three pairs on the middle line (one pair on the forecastle) and one pair on each beam. Eight can fire on either broadside, six ahead and six astern. The anti-torpedo boat armament consists of twenty-seven 12-pounder quick-firing guns of a new design and greater power than hitherto employed. The machinery, of course, is on the turbine principle with four shafts. There are astern turbines on each shaft to give large stopping and astern capability. The weight of hull and armor is 11,100 tons, and, taking Sir Philip Watt's figure of 35 per cent of the displacement for hull we have, hull 6,250 tons, armor 4,850 tons.

The three cruisers now building at Elswick, Clydebank, and Fairfield respectively (the Invincible, Inflexible, and Indomitable), are very remarkable ships in point of size, although the admiralty is still silent as to their armament and speed. These ships are 530 ft. long, 78½-ft. beam, 26 ft. draught, and 17,250 tons displacement. They are thus nearly as large as the Dreadnought, but rather finer, the coefficients of fineness being 0.56 and 0.59 respectively. The weight of hull and armor is given as 9,660 tons, which, allowing 6,200 tons for hull, leaves 3,460 tons for armor. It is thus evident that these ships are much more lightly protected than the Dreadnought, and the obvious inference is that something exceptional in the way of speed is being attempted. Seeing that 23 to 24 knots has been obtained in cruisers in recent years, it is more than likely that 25 knots is being aimed at. The details of the cost of these ships is not given, but the total cost, including guns, of the ships in the above order are respectively £1,736,645, £1,726,990, £1,730,733, which is very close to the figure for the Dreadnought, viz., £1,797,497. The armament is not given, but from the very secrecy that is observed one would gather that there is something out of the ordinary, and it is very probable that 12-in. guns are being supplied. In our comparisons with foreign powers one has to remember that units are apt to be misleading. Thus the French Victor Hugo, of 12,300 tons, the German "C," of 11,420 tons, are first-class armored cruisers and each count one, but are far inferior to the three cruisers we have been considering, each of 17,250 tons.

The other ship of special interest is the Swift, the experimental 36-knotter. The contract for this ship has been obtained by Messrs. Cammell, Laird & Co. The particulars are: Length, 345 ft.; breadth 34 ft. two inches; draught, 10 ft. five inches; displacement, with 180 tons of oil, 1,800 tons, and for the 36 knots no less than 30,000 I. H. P. is to be installed, of course on the turbine principle. This wonderful ship is to carry four four-inch guns, and she will cost altogether £280,509. Of this £91,000 is for the hull, £180,000 for the machinery, the remainder being for guns and torpedo tubes. I believe that the builders have got a tough job in this contract and I hope they will fare better than with the Express, which cost the firm a pretty penny for trials and penalties.

Capt. A. J. Kotcher has been appointed master of the steamer H. S. Pickands.

LIVERPOOL SHIPPING INTERESTS PESSIMISTIC.

From inquiries made by a representative of the Liverpool *Journal of Commerce* in Liverpool shipping circles respecting the present position and prospects of Britain's principal industry, it appears that many ship owners are of opinion that the shipping market is in a worse condition for general trade or tramp lines than for some considerable time, and that the immediate prospects are no better. It was stated that in a few of the regular trades—notably the Atlantic—there certainly was an improvement over the position a year ago, but, generally speaking, it might be taken for granted that any rise in freight rates was more than counteracted by the increase and concentration of tonnage, which reduces the quantities obtainable. The effect of the new freeboard regulations has been to lower rates, as the extra carrying capacity represents a vast total increase in British tonnage—roughly, half that owned throughout the world. During the first seven months of the current year a record output of new tonnage was also reported. A large proportion of this is now in commission, and more additions to the active fleet are daily taking place, this, of course, having its effect upon the market. As to the future, the fact that on July 1 last considerably over a million and a quarter tons of shipping was under construction or on orders cannot but be prejudicial to existing tonnage. It was further pointed out that the increase of the world's ocean carrying capacity far overreaches the development of the world's trade, so that unless investors soon get tired of putting their money into steel ships, a much worse time is in store than has ever been experienced in the history of the industry.

In the matter of sailing vessels it was pointed out that they can now only get low rates to the west coast of South America, and since they are unable to get anything to carry from thence they have to sail in ballast. The ships of the Sailing Shipowners' Union are entirely barred, because there is a vast difference between the minimum rates permissible for them to accept and the freight actually ruling. Steamers, it was said, are carrying cargo from west coast ports at 13s or 14s per ton, while the sailing vessels in the union cannot accept anything under, say, 21s. This makes trading impossible for the sailer. What with the disturbance in the eastern trade, the delays in the River Platte, the cut-throat competition on the west coast, and the gradual absorption of the special trades by powerful lines there is a strong feeling that there is little chance for the general trader and a very poor outlook.

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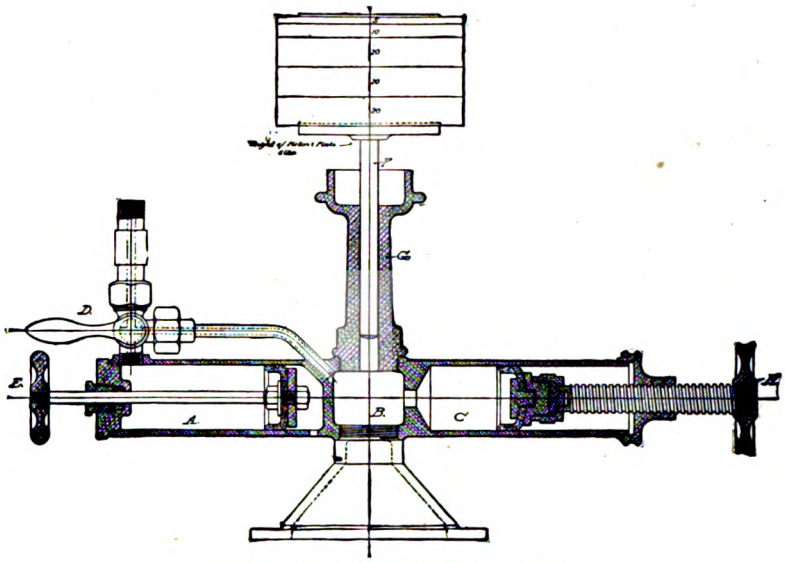
AMERICAN DEAD WEIGHT TESTER.

The novel features of the device consist of an auxiliary cylinder A connected with the gauge and main pump cylinders B and C through three-way cock D, the connection being made by turning the lever cock connected with either gauge or main pump cylinders, as is desired, eliminating the necessity of pouring the oil in and out of the pump cylinders before and after testing. The auxiliary oil chamber A and main pump cylinders B and C are filled with a light mineral oil, cylinder A being filled through pump cylinder G by removing plunger F, turning the three-way cock so as to connect cylinders A and B through the connecting tube.



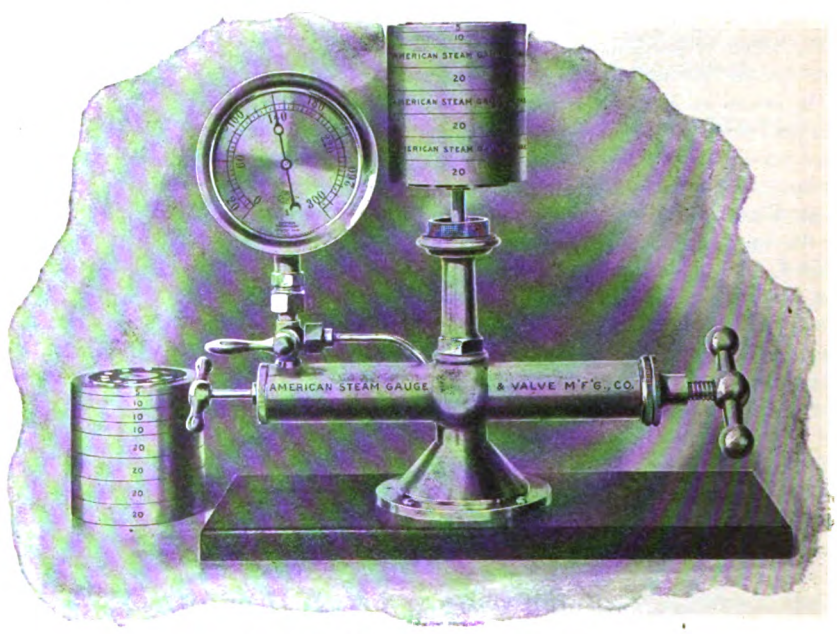
AMERICAN DEAD WEIGHT TESTER.

Before the oil is poured in, withdraw plunger E, and as the oil is poured in, push in on the plunger E, drawing oil over through tube and cock; thus, filling cylinder A. Main pump cylinders B and C are filled through pump cylinder G by screwing out on screw plunger H as the oil is poured in; in testing, it is not necessary to continually screw in on the pump plunger H. This is necessary in some of the other makes of dead weight testers.

After the table and piston F have been lowered by the first application of weights and have been raised with the screw plunger, it is only necessary to raise table and plunger twice while testing to 500 lbs. Another feature is the fact that after completing test of the gauge, the cock may be turned connecting gauge with cylinder A, and by pushing in on plunger F the connections and gauge then can be drained by the oil, thus preventing spilling when the gauge is disconnected.

The gauge to be tested is attached to the nipple connected by union above three-way cock D. The gauge and fittings are then filled by withdrawing piston E; then turn the three-way cock in the position which places the gauge in communication with chamber A. When the movement of the index hand indicates what pressure is on the gauge, the three-way cock is turned so as to put the gauge in communication with chamber B. The weights are then applied to the desired pressure, being revolved from time to time to obviate friction.

The table and piston F operate the pressure about five pounds per square inch and the five, ten and 20-lb. weights sent with tester are used to obtain the desired pressure for test. After weights are first applied, table should be raised to a position of 2½ in. above cylinder G to prevent table from striking. The table is raised by screwing in plunger H. The pump is neatly boxed and furnished with the following fittings: Necessary wrenches, hand set, hand jack, four connection nipples and plyers. The accompanying weights are furnished in a separate box. This tester is manufactured by the American Steam Gauge & Valve Mfg. Co. of Boston.



AMERICAN DEAD WEIGHT TESTER.

A clay model of a monument to Robert Fulton has been received from Leopold Brackony, sculptor, by the Robert Fulton Monumental Association, and it is understood that the design has been accepted by the association, whose headquarters are at No. 3 Park Row, New York. Mr. Cornelius Vanderbilt is president of the association and Richard Delafield, treasurer. The monument will be built, if possible, through small contributions from the public.

Assistant United States Engineer Howard E. Smith, located at Ashtabula harbor, conducted a fruitless search last week, for the sunken crib reported by the steamer Helena sixteen miles off the shore. He used the tender Visitor in making it.

Libraries have been installed on the big Cleveland-Cliffs steamers and one of the duties of the mates, who have charge of the books, is to keep a record of the books read and by whom they were read. This rule is observed on both ends of the boats.

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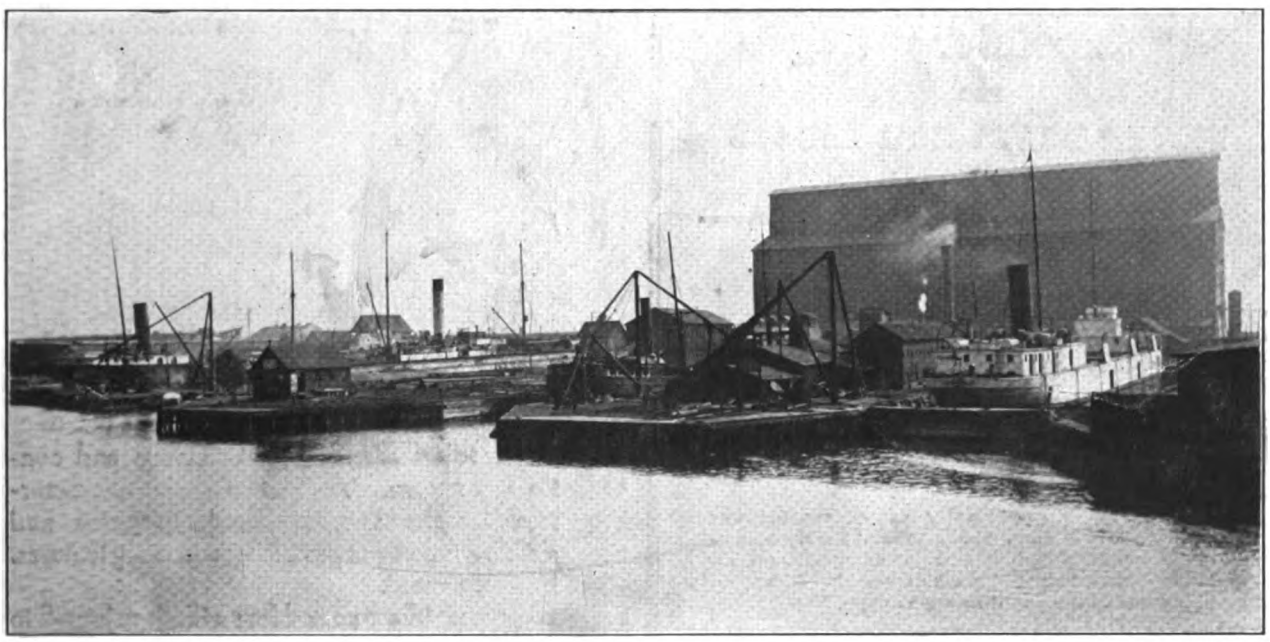

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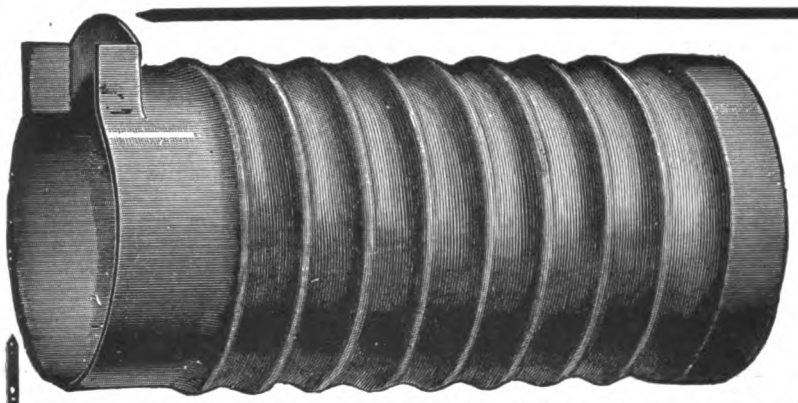

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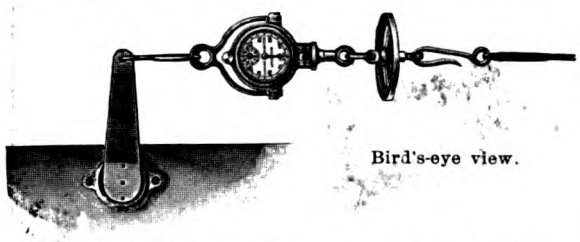

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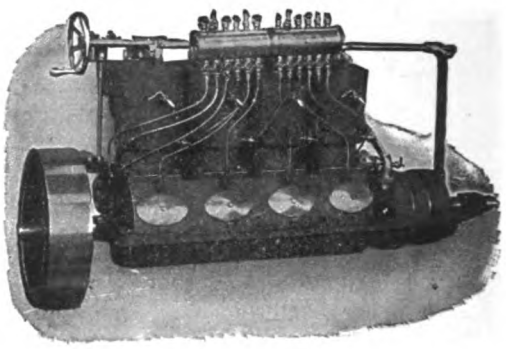

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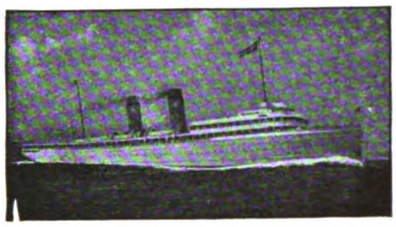

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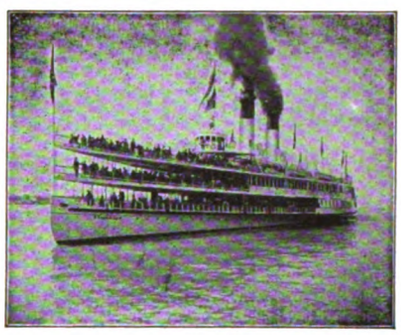

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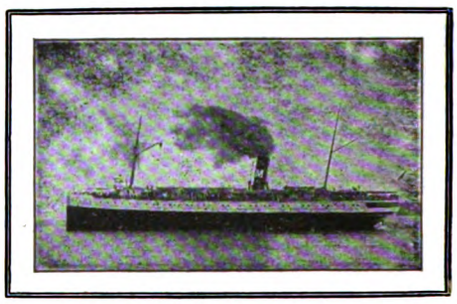

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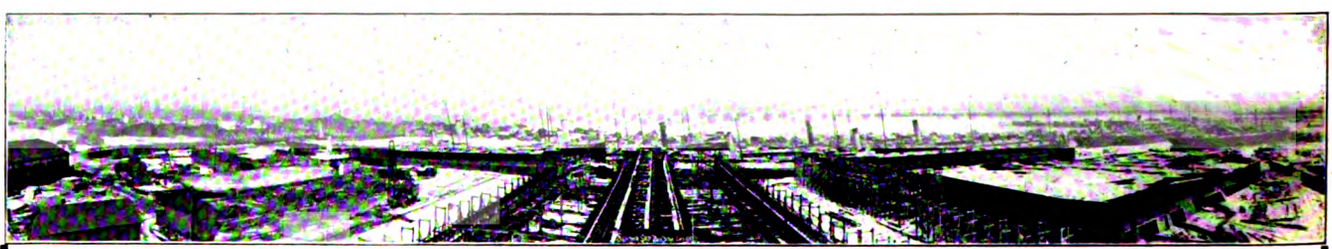

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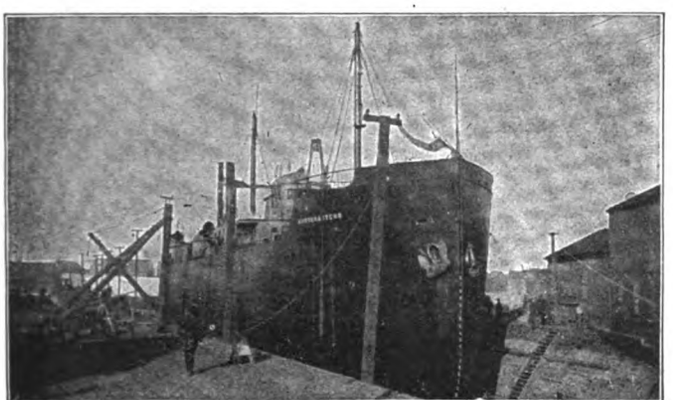

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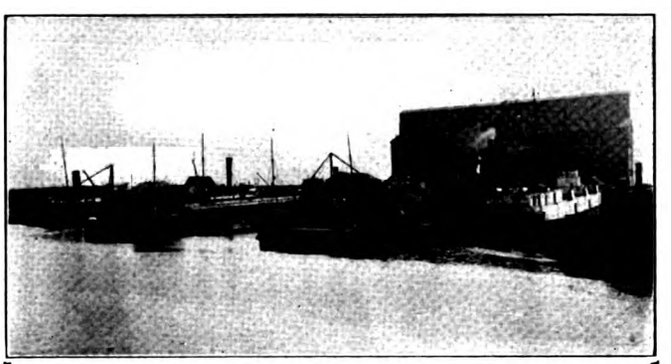

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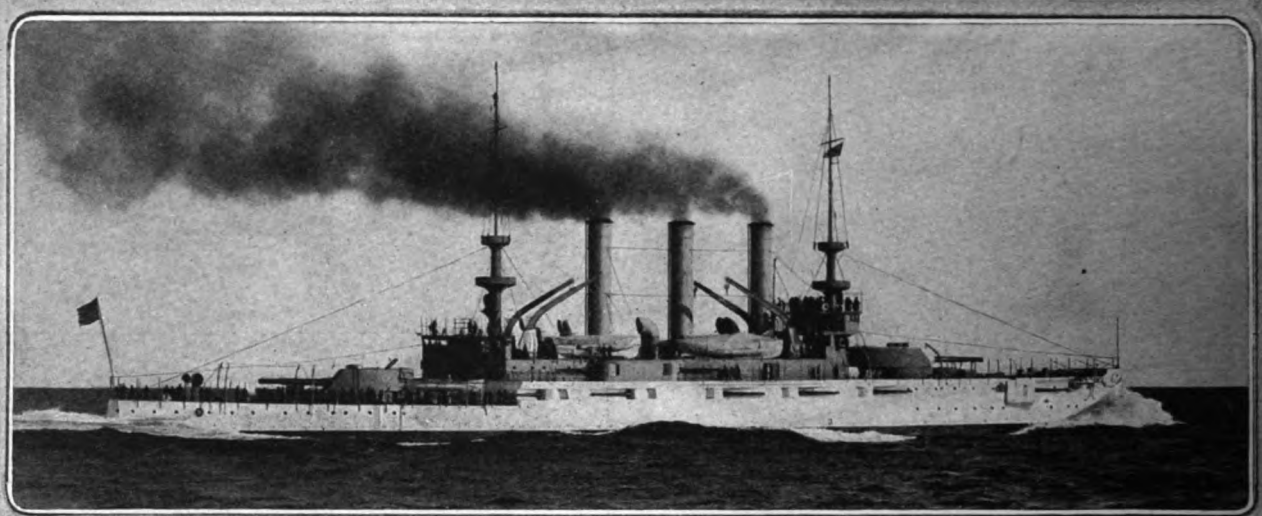

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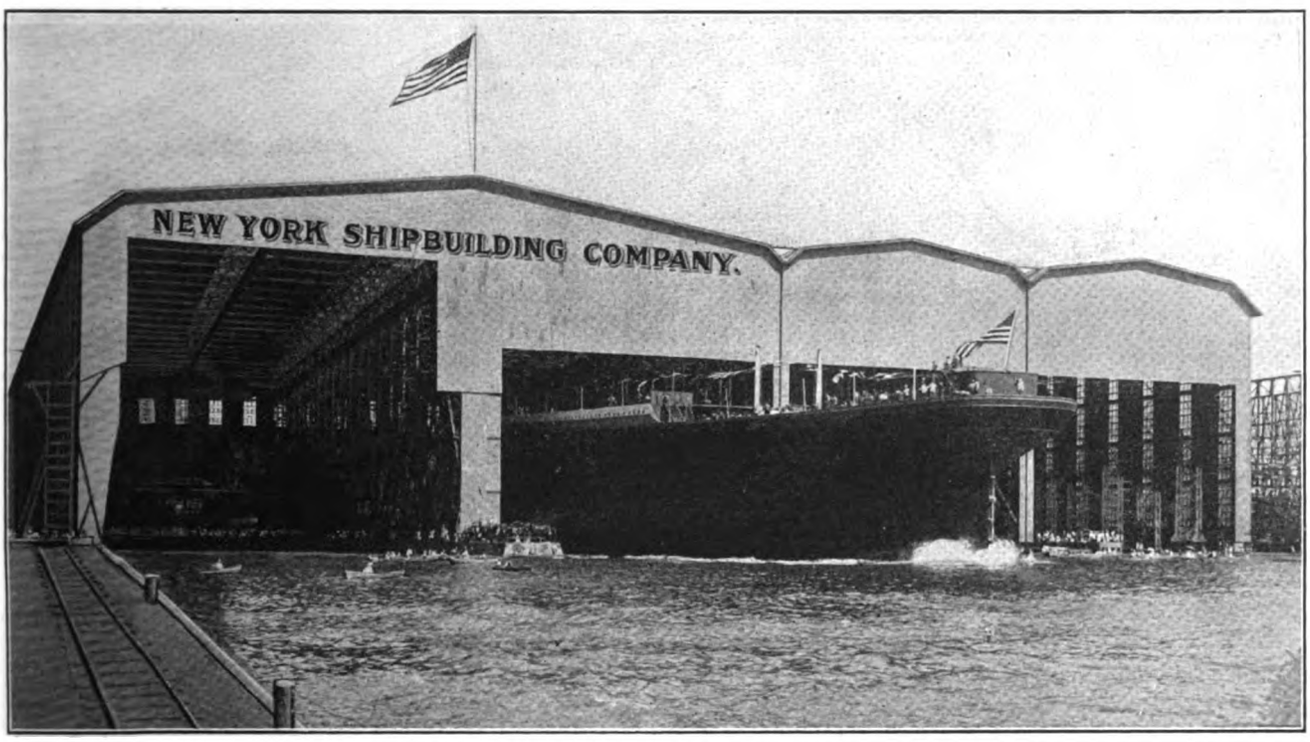

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MADE IN CANADA BY
The Penberthy Injector Co., Ltd.,
Windsor, Ont.

U.S. Automatic Injector

In the mind of "Uncle Sam"

the U. S. Automatic is the World's best injector. It is officially endorsed by the U. S. Government because of superior merit.

The **U. S. Automatic** feeds hotter water than any other injector and works equally well as a lifting or non-lifting injector. Never freezes, easily cleaned and always reliable. Saves fuel, water and worry—100% efficiency.

Each one is tested before leaving factory and actual results shown on the Certificate of Range and Capacity attached to it. Business prudence demands that you buy the **U. S. Automatic** injector.

Free. Let us send you a copy of our famous **"Engineer's Red Book"**—free on request.

American Injector Co.
DETROIT, U. S. A.

CHARLES E. PECK. WILLIAM A. PRIME.

CHAS. E. & W. F. PECK,

Insurance Brokers. Average Adjusters.

ESTABLISHED 1870.

NEW YORK, 58 William Street.
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BUFFALO, 914 The Fidelity Bldg.
CLEVELAND, 1006-1008 Rockefeller Bldg.
CHICAGO, 1114-15 Royal Insurance Bldg.

REPRESENTED BY
C. T. BOWRING & CO., (Insurance) LTD.,
5 and 6 Billiter Ave., LONDON,
and at "LLOYD'S" LONDON.

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We place insurances in the most advantageous markets, employing, in the interest of our clients and with equal facility, all Foreign and Home companies, at the best procurable rates and terms.

We Represent Only the Assured.

GREAT LAKES REGISTER

FOR THE CLASSIFICATION OF STEEL AND WOODEN VESSELS.

Estb. 1828 — Estb. 1898

COMBINED AND ISSUED IN CONNECTION WITH

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INTERNATIONAL REGISTER OF SHIPPING.

THE RATINGS OF GREAT LAKES REGISTER GO BEFORE AND ARE ACCEPTED BY THE LEADING UNDERWRITERS OF AMERICA AND EUROPE. VESSELS BUILT UNDER THE SUPERVISION OF ITS SURVEYORS WILL RECEIVE SPECIAL RATING, AND WILL ALSO BE PUBLISHED IN BUREAU VERITAS INTERNATIONAL REGISTER OF SHIPPING.

PLANS AND SPECIFICATIONS FURNISHED.

GREAT LAKES REGISTER SURVEYORS ARE ESTABLISHED AT ALL THE PRINCIPAL PORTS ON THE GREAT LAKES.

F. D. HERRIMAN, SURVEYOR GENERAL,
820-822 Perry-Payne Building, · · · CLEVELAND, O.

Alphabetical Index of Advertisers

on page 49 this issue.

The Blue Book of American Shipping, Marine Directory of the World, $5.00

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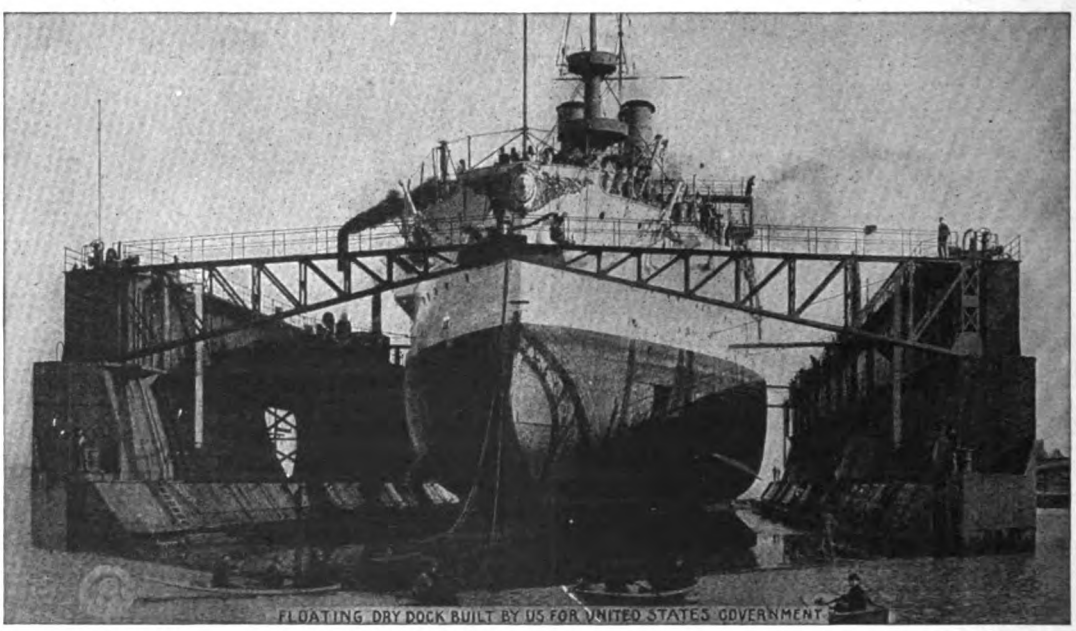
MARYLAND STEEL COMPANY

BUILDERS OF STEEL STEAMSHIPS, TOW BOATS, SAILING VESSELS, BARGES AND STEAM CRAFT OF EVERY DESCRIPTION

STEEL FLOATING DRY DOCKS CAPABLE OF DOCKING THE LARGEST VESSELS



FLOATING DRY DOCK BUILT BY US FOR UNITED STATES GOVERNMENT

SPARROW'S POINT, MARYLAND.

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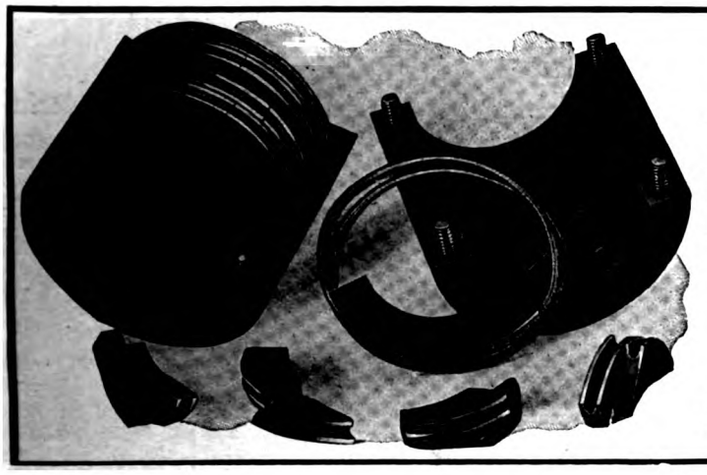

National Metallic Packing

PATENTED IN U. S. AND FOREIGN COUNTRIES.

This packing is giving perfect satisfaction on all styles of rods on marine and stationary engines, locomotives and air compressors, and works perfectly on all sizes of rods from the highest to the lowest pressure. A glance at the above cut will show that the packing is arranged so that it adjusts itself to the rod and gives the rod a high polish and reduces the friction to a minimum.

The National Metallic Packing Co.,
OBERLIN, O.

EUGENE PASSANO, Gen. Marine Agent, Western Reserve Bldg., Cleveland, O.
THOMAS B. BANNER, Marine Agent, 57 E. Kinzie St., Chicago, Ill.
DOWNEY & KRUSE, Marine Agents, Milwaukee, Wis.

"RAINO"

For Hard Service

"Raino" is a guaranteed absolutely waterproof cloth.

For ships' officers, yachtsmen, seamen, etc., it is the ideal waterproof garment.

"Raino" is very light, clean and neat looking. Far superior to either oilskins or rubber. It will not rot, nor is it stiff, heavy, oily or foul smelling.

After two years of the hardest kind of army and naval service tests in all parts of the world hundreds of officers declare it the most durable waterproof garment made.

"Raino" officer's Long Coat	$6.00
"Raino" Medium Coat	5.00
"Raino" Jacket	4.50
"Raino" Overalls	2.25
"Raino" Soft Squam Hat	1.00

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(Makers of the famous Armstrong Uniforms.)
Write for prices on Uniforms.
315-321 Wabash Ave., Chicago.

ARMSTRONG GUARANTEE.
A week's trial, Rain, Hose or Shower. If not satisfactory express back at our expense. Money returned. Show our faith.

THE ROBERTS
SAFETY WATER-TUBE
BOILER CO.

Manufacturers of High Grade

Marine Water Tube Boilers

Generators of the Highest Quality of Steam

NEARLY 1500 IN USE

Send for circulars and stock sheet

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Phone 599 Cortlandt

Works: Red Bank, N. J.
Phone, 49 Red Bank

Cable Address
"Bruniva"

OTIS STEEL

SHIP PLATES FLANGE PLATES TANK PLATES STEEL CAR AXLES FORGINGS OF ALL KINDS

"Otis" Fire Box Plates a Specialty.

STEEL CASTINGS FROM 100 TO 100,000 LBS.

OTIS STEEL CO., Ltd., Head Office and Works, **CLEVELAND, O.**

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Montreal: Homer Taylor, 183 St. James St.
St. Louis: C. A. Thompson, 516 N. Third St
San Francisco: John Woodlock, 154-156 First St.
Detroit: George W. House, Union Trust Building.

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GREAT LAKES ENGINEERING WORKS

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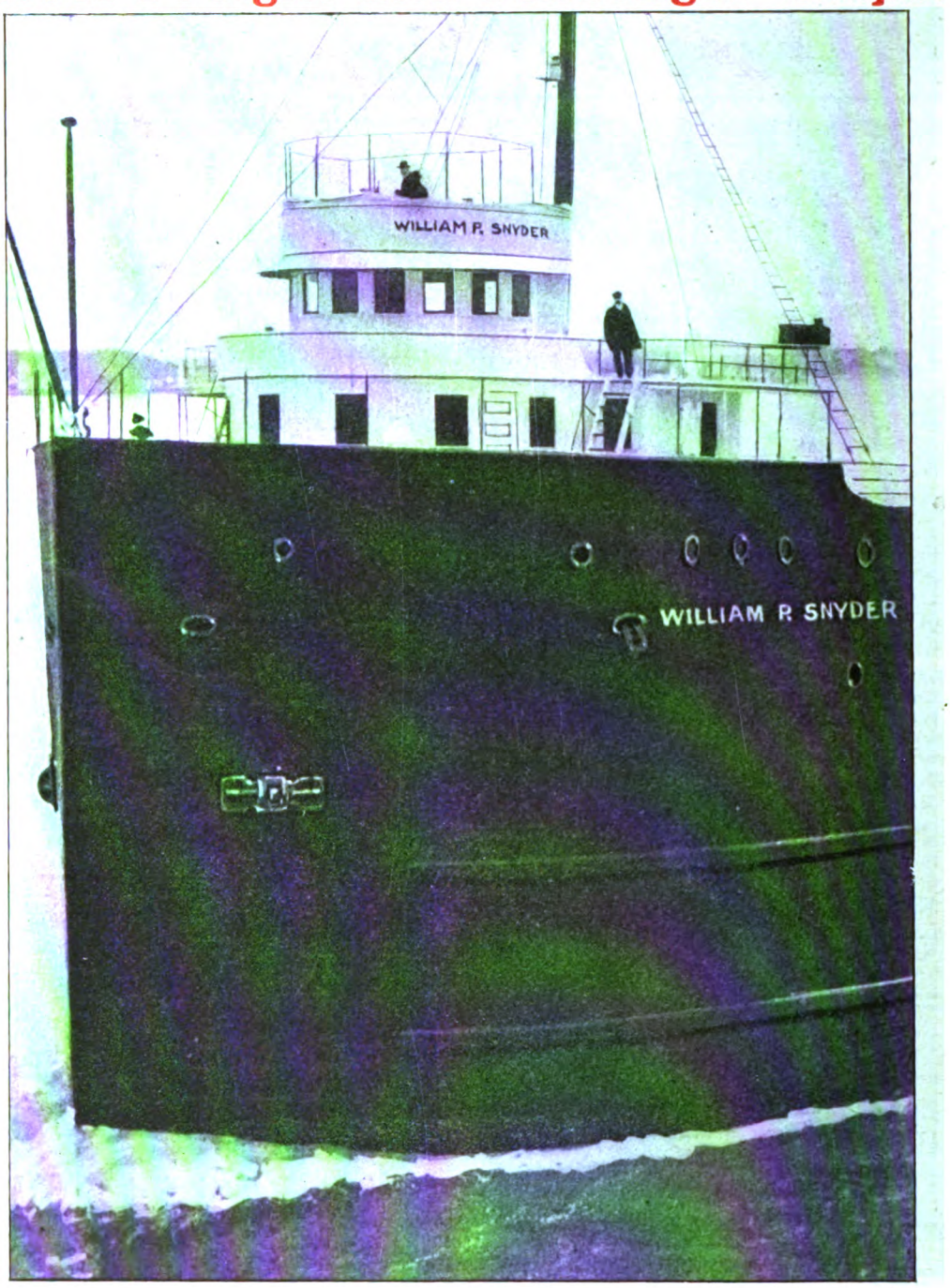
ANTONIO C. PESSANO, President and Gen. Mgr.

GEORGE H. RUSSEL, Vice President.

JOHN R. RUSSEL, Secretary and Treasurer.

Designers and Builders of Steel Freight and Passenger Ships.



STEAMER "WILLIAM P. SNYDER,"

550 Feet Long, 56 Feet Beam.

Designed and built by us and equipped with patented hawse pipes which permits the anchors being stowed very snugly, bringing them practically flush with outside of the hull. Expensive and serious damage in case of collision is avoided by use of this improvement.

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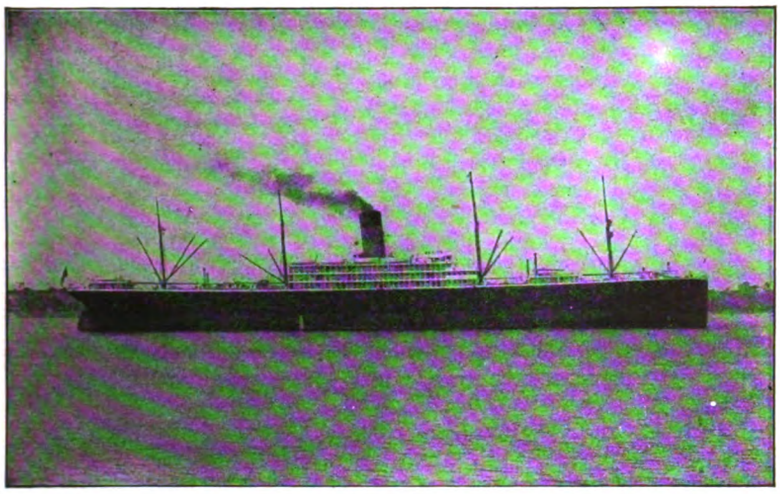
Hyde Windlasses and Capstans



Steamship Minnesota equipped with Hyde Windlass and Capstans.

Selected for the Minnesota and Dakota of the Great Northern Steamship Co.'s fleet—the largest vessels ever built in the United States. They are also being installed on nearly all of the vessels now building for the Navy Department, Revenue Cutter service, Lighthouse Board and the United States Coast Survey.

Reason—Their Superiority

Send for Illustrated Catalog.

HYDE WINDLASS COMPANY

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Geo. L. McCurdy

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INSURANCE

HULLS and CARGOES

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PIG IRON
COKE
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The Water Light

Self-Igniting Inextinguishable
For

Life Saving
Distress Signal
Repairs and
Construction.
Salvage
Submarine
General
Illumination.

Send for Sample. *Agents wanted.*

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BALTIMORE, MD.

Especially approved by The British Board of Trade, either of Life Buoy Lights or Deck Flare.

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WANTED and FOR SALE

PROPOSALS.

SEALED PROPOSALS will be received at the office of the Light-house Board, Washington, D. C., until 2 o'clock P. M., September 29, 1906, and then opened for furnishing the materials and labor of all kinds necessary for the construction and delivery of five steel, steam light-vessels, Nos. 84, 85, 86, 87, and 88, at The Light-House Depot, Tomkinsville, Staten Island, New York; or four of these light-vessels, Nos. 84, 85, 86 and 87, at The Light-House Depot, New York, and No. 88 at The Light-House Depot, Astoria, Oregon, in accordance with specifications, copies of which, with blank proposals and other information, may be had upon application to The Light-House Board, Washington, D. C.

FOR SALE.

Steamer T. S. Christie.

Length 160 ft.; beam 30 ft.; carrying capacity, lumber 525,000 ft., coal 800 tons. Rating in Inland Lloyds Register, A1½*, valuation $22,000. For price and particulars address Capt. P. Larsen, Box 249, Chicago, Ill.

For Sale, Tug Gladiator.

Length, 115 ft.; breadth, 22 ft.; depth, 12 ft. Steeple compound engine 22 x 42 x 30. Housed in forward. Tug can be seen under working conditions at Duluth, Minn., by applying to Split Rock Lumber Co., Duluth, Minn.

Steamer for Sale Cheap.

The lighthouse steamer Haze, 145 ft. long, 27-ft. beam, 9-ft. draught, 500 tons capacity, 300 horsepower engine and boiler, suitable for passenger or freight business, fully equipped. Steam capstan, donkey boiler. Jacob Ullman, 46 Lloyd street, Buffalo, N. Y.

Steamer Hazel

FOR SALE.—The passenger and freight steamer "Hazel." Length, 93 ft.; beam, 18 ft.; draught about 7 ft. 6 in. For further particulars address R. B. Rice, Grand Haven, Mich.

FOR SALE.

Passenger and package steamer and long established route. Two trips daily between 9 a. m. and 6 p. m. Owner in other business. Exceptional opportunity for investment by Captain or Engineer desirous of engaging in business where he will be at home during entire season. Boat practically new. For full particulars address, *Steamer,* MARINE REVIEW, Cleveland, O.

GASOLINE ENGINE.

FOR SALE.—One ten H. P. gasoline engine, four cycle, for launch. Used only one season, in first class condition.

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Cleveland, O.

For Sale.

1,000 h. p. fore and aft Neafie & Levy compound Engine; surface condenser; independent pumps.
Two 12-foot Scotch Boilers.
One 13½-foot Scotch Boiler.
One 10 16-25 x 16 triple expansion Engine.
Three 150-h. p. Almy Boilers.
One 200-h. p. Tregurtha Boiler.
One 14 30 x 24 fore and aft Engine and condenser.
One Williamson steering Engine.
One 10 k. w. electric lighting Set.
One 15 k. w. electric lighting Set.
One Providence Windlass, 50 fathoms 1½ in. chain.
Two thrust Shafts and Bearings, 8½ in. diameter.

MARVIN BRIGGS,
17 Battery place, New York, N. Y.

Boilers for Sale.

Five Scotch Boilers, allowed 160 lbs, steam. Good as new. ERIE MACHINERY CO., 729 Garfield Bldg. Cleveland, O.

Steamer Canada.

123 ft long, 24½ ft. beam, hull, 4-inch oak; speed, 11 to 12 miles; 200 tons freight, 8 state-rooms for passengers, dining accommodation and equipment for forty passengers, ferry license for 450 people; engine fore and aft compound 18 and 32 by 18, new Scotch boiler 11¼ x 13, electric lighted. Can now be seen running on ferry route between Owen Sound and King's Royal Park. Possession given after September 1st, price $7,000.00. For further particulars apply to J. K. McLaughlan, Owen Sound Park Co., Owen Sound, Ont.

WANTED

PASSENGER STEAMER.

WANTED.—A small passenger steamer in exchange for tug 77 ft. over all, beam, 18 ft.; draught, 7 ft.; engine, 16 in. by 16 in.; boiler, steam allowed, 110; hull rebuilt 1904. Address C. H. M., MARINE REVIEW, Cleveland, O.

BRIEFS

Read everywhere by men with marine interests. They pull. Tell your wants on this page—say it in an inch or two.

1 Inch, 1 Time, 1 Dollar.

HAVE YOU

noticed how most people closely scan the "for sale" and "wanted" columns of their trade paper? Tell them through the MARINE REVIEW what you want or what you have for sale. They want to know. The cost is a trifle, $1 the inch. One dollar the minimum.

A Handy Little Chart of the Great Lakes

Mounted on Linen. **10½ X 15 INCHES.** **Price Postpaid, 25 cts.**

Clearly showing every port on the Great Lakes from Clayton to Duluth. It is small enough to fold up and carry in the coat pocket or pigeon hole of a desk, and is also very suitable for framing.

With this little chart near at hand, you save the trouble of stepping to a chart case and taking out a great big three-foot square chart that is awkward to handle.

The Most Accurate Small Chart Ever Published.

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THE MARINE REVIEW, - - CLEVELAND.

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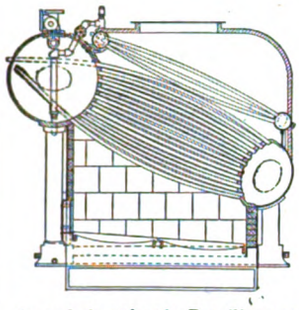
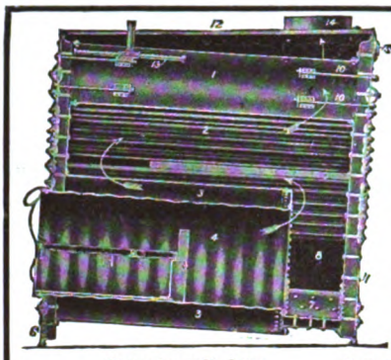
THE MOSHER PATENT WATERTUBE BOILER



Simplest, lightest most compact boiler made. Most accessible for cleaning and repair. Five vertical rows or as many as 45 tubes may be cleaned or withdrawn by removing the cover from a single hand hole. Largest grate surface on a given floor space. No joints in the fire. All joints expanded. Greater steam room and water capacity than any other boiler. Built in sizes up to 2000 H. P. Mosher Boilers have been supplied for eleven torpedo boats and the monitor Florida of the U. S. Navy, amounting to over 26,000 H. P., six torpedo boats for the Russian Navy two gun boats for the Mexican government, one cruiser and one torpedo boat for the Brazilian government; the steam yachts Arrow, Elide, Feiseen, Wauneta, Presto, and numerous other yachts and vessels.

SEND FOR DESCRIPTIVE CATALOGUE.

MOSHER WATERTUBE BOILER CO., No. 1 Broadway, N. Y.



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Internally Fired.

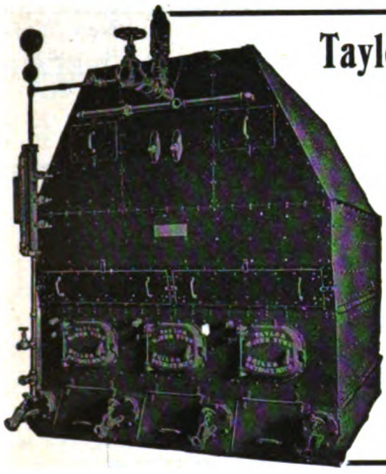
Scotch and Water Tube types combined, eliminating all objections.

Half the weight of ordinary Scotch boilers.

Standard corrugated furnaces.

Patent applied for. Investigate before buying any other.

EAST END BOILER WORKS
Detroit, Mich.

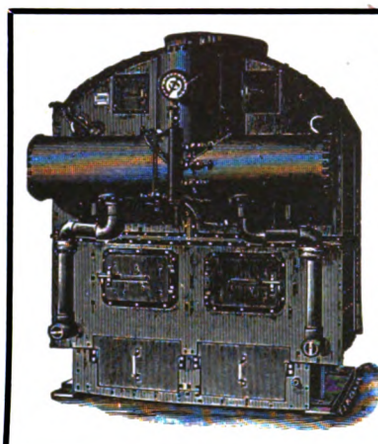


Taylor Water Tube Boiler Co.

Vertical Tubes, sectional, large steam space and liberating area.
Fire box, combustion chamber, and course for the furnace gases similar to the Scotch Marine.
Free circulation type.

Send for full description.

322 Franklin St.
DETROIT, MICH.



350 STEAM VESSELS

Now Equipped With

ALMY'S PATENT SECTIONAL Water Tube Boilers

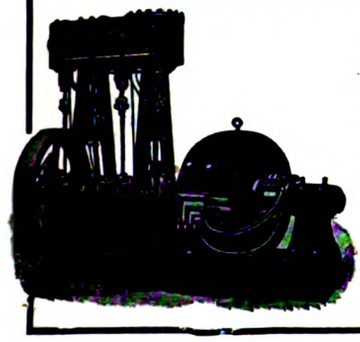
Bear Evidence of Their

Excellent Qualities

ALMY WATER-TUBE BOILER CO.
PROVIDENCE, R. I.

We offer an

Engine for Direct-Connected Electric Plants



which we can guarantee to stand up under extreme changes from no load to full load, and to REGULATE TO PERFECTION.

That its construction is strong is self-evident

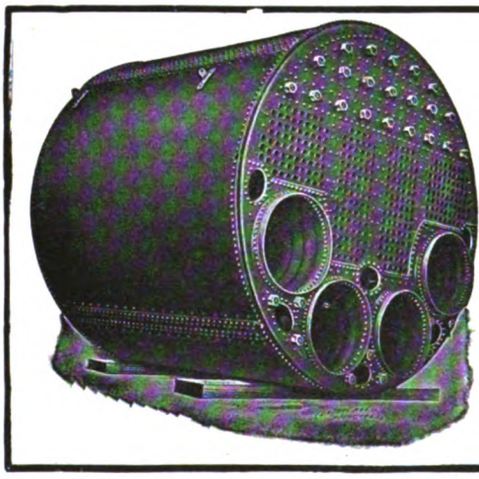
The shaft, rods, valve stems and other working parts are made of forged steel.

Every bearing is automatically lubricated.

In finish it is all that can be desired.

Write for full particulars and tests.

John E. Thropp & Sons' Co.
TRENTON, N. J.



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OF ALL TYPES

KINGSFORD FOUNDRY & MACHINE WORKS,
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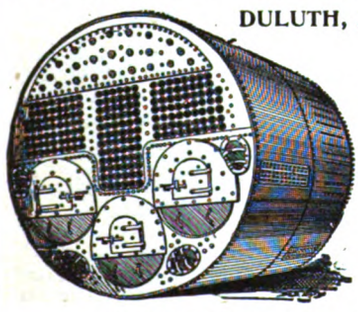
Northwestern Steam Boiler & Mfg. Co.

DULUTH, MINN.



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Special facilities for Marine Work. Repairs promptly attended to Night or Day.

We carry a complete line of Marine and Engineers' Supplies.

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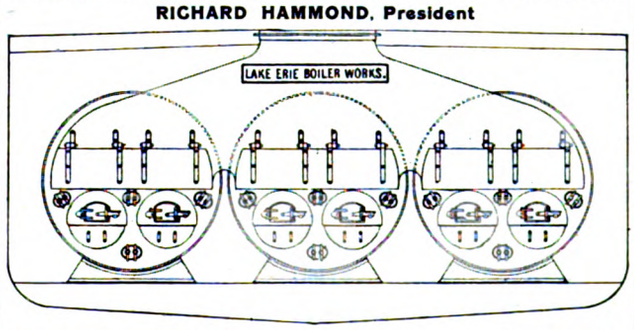
RICHARD HAMMOND, President



THE BEST EQUIPPED PLANT IN AMERICA FOR THE MANUFACTURE OF MODERN MARINE BOILERS

BUFFALO, N. Y.

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[See accompanying Index of Advertisers for full addresses of concerns in this Directory.]

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Great Lakes Engineering Works....Detroit.

AIR PORTS, DEAD LIGHTS, ETC.
Marine Mfg. & Supply Co.....New York.

AIR PUMPS AND APPLIANCES.
Fore River Ship & Engine Co.....Quincy, Mass.
Great Lakes Engineering Works....Detroit.

ANCHORS.
Bowers, L. M. & Co.....Binghamton, N. Y.

ANTI-FRICTION METALS.
Cramp, Wm. & Sons....Philadelphia.

ARTIFICIAL DRAFT FOR BOILERS.
American Ship Building Co.....Cleveland.
Detroit Ship Building Co....Detroit.
Great Lakes Engineering Works....Detroit.

ASH EJECTORS.
Great Lakes Engineering Works....Detroit.

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Goulder, Holding & Masten.....Cleveland.
Hoyt, Dustin & Kelley....Cleveland.
Jenkins, Russell & Eichelberger....Cleveland.
Kremer, C. E. .....Chicago.
MacDonald, Ray G.....Chicago.
Shaw, Warren, Cady & Oakes.....Detroit.
White, Johnson, McCaslin & Cannon.....Cleveland.

BAROMETERS, MARINE GLASSES, ETC.
Ritchie, E. S. & Sons.....Brookline, Mass.

BELTING (LEATHER.)
Republic Belting & Supply Co.....Cleveland.

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Boston Lockport Block Co.....Boston, Mass.

BLOWERS.
American Blower Co., Detroit, Mich.

BOAT BUILDERS.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, David.....New York.
Marine Construction & D. D. Co....Mariner's Harbor, S. I., N. Y.
Truscott Boat Mfg. Co.....St. Joseph, Mich.

BOILER COMPOUNDS.
The Bird-Archer Co.....New York
Dearborn Drug & Chemical Works.....Chicago.
Lake Erie Boiler Compound Co.....Buffalo
State Manufacturing Co...Cleveland.

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Almy Water Tube Boiler Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Atlantic Works..East Boston, Mass.
Briggs, Marvin.....New York.
Chicago Ship Building Co..Chicago.
Cramp, Wm. & Sons..Philadelphia.
Dearing Water Tube Boiler Co....Detroit.
Detroit Ship Building Co....Detroit.
East End Boiler Works....Detroit.
Fletcher, W. A. & Co.....Hoboken, N. J.
Fore River Shipbuilding Co.....Quincy, Mass.
Great Lakes Engineering Works....Detroit.
Kingston Foundry & Machine Works .....Oswego, N. Y.
Lake Erie Boiler Wks.....Buffalo
Maryland Steel Co.....Sparrow's Point, Md.
Milwaukee Dry Dock Co.....Milwaukee.
Mosher Water Tube Co..New York.
Newport News Ship Building Co..Newport News, Va.
New York Shipbuilding Co.....Camden, N. J.
Northwestern Steam Boiler & Mfg. Co.....Duluth, Minn.
Quintard Iron Works Co.....New York.
Roberts Safety Water Tube Boiler Co. .....New York.
Superior Ship Building Co.....Superior, Wis.
Taylor Water Tube Boiler Co....Detroit.
Toledo Ship Building Co.....Toledo.

BOILER RIVETS.
Bourne-Fuller Co.....Cleveland.

BOILER STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

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Fore River Ship & Engine Co.....Quincy, Mass.
Great Lakes Engineering Works..Detroit.
Lunkenheimer Co.....Cincinnati.

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Scherzer Rolling Lift Bridge Co....Chicago.

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G. H. Williams Co.....Cleveland.

CABIN AND CABINET FINISHING WOODS.
Martin-Barriss Co.....Cleveland.

CANVAS SPECIALTIES.
Baker & Co., H. H.....Buffalo.
Bunker, E. A.....New York.
Upson-Walton Co.....Cleveland.
Republic Belting & Supply Co....Cleveland.

CAPSTANS.
American Ship Windlass Co.....Providence, R. I.
Dake Engine Co.....Grand Haven, Mich.
Hyde Windlass Co.....Bath, Me.
Marine Mfg. & Supply Co.....New York.

CEMENT, IRON FOR REPAIRING LEAKS.
Smooth-On Mfg. Co.....Jersey City, N. J.

CHAIN SURVEYORS, HOISTS.
Brown-Hoisting Machinery Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.

CHAIN HOISTS.
Boston & Lockport Block Co.....Boston, Mass.
Republic Belting & Supply Co.....Cleveland, O.

CHARTS.
Penton Publishing Co....Cleveland.

CLOCKS (Marine and Ship's Bell) AND CHRONOMETERS.
Ritchie, E. S. & Sons.....Brookline, Mass.

COAL PRODUCERS AND SHIPPERS.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co....Cleveland.
Pittsburg Coal Co.....Cleveland

COAL AND ORE HANDLING MACHINERY.
Brown-Hoisting Machinery Co.....Cleveland.

COMPASSES.
Ritchie, E. S. & Son.....Brookline, Mass.

CONDENSERS.
Great Lakes Engineering Works....Detroit.
Thropp & Sons Co., John E.....Trenton, N. J.
Wheeler Condenser & Engineering Co.....New York.

CONTRACTORS FOR PUBLIC WORKS.
Breymann Bros., G. H.....Toledo.
Buffalo Dredging Co.....Buffalo.
Dunbar & Sullivan Dredging Co....Buffalo.
Great Lakes Dredge & Dock Co....Chicago.
Hickler Bros.....Sault Ste. Marie, Mich.
Hubbell Co., H. W..Saginaw, Mich
Smith Co., L. P. & J. A...Cleveland.
Starke Dredge & Dock Co., C. H...Milwaukee.
Standard Contracting Co..Cleveland.
Sullivan, M.....Detroit

CORDAGE.
Baker & Co., H. H.....Buffalo.
Upson-Walton Co.....Cleveland.

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Buyers' Directory of the Marine Trade.—*Continued.*

CORK JACKETS AND RINGS.
Armstrong Cork Co..Pittsburg, Pa.
Kahnweiler's Sons, D....New York.

CRANES, TRAVELING.
Brown-Hoisting Machinery Co.....
.... Cleveland.

DIVING APPARATUS.
Morse, A. J. & Son.....Boston.
Schrader's Son, Inc., A..New York.

DREDGING CONTRACTORS.
Breymann & Bros., G. H....Toledo.
Buffalo Dredging Co.....Buffalo.
Dunbar & Sullivan Dredging Co....
.... Buffalo.
Great Lakes Dredge & Dock Co..
.... Chicago.
Hickler Bros. .....
.....Sault Ste. Marie, Mich.
Hubbell Co., H. W..Saginaw, Mich.
Smith Co., L. P. & J. A...Cleveland.
Starke Dredge & Dock Co., C. H...
....Milwaukee.
Sullivan, M.....Buffalo.

DREDGING MACHINERY.
Quintard Iron Works Co.New York.

DRY DOCKS.
American Ship Building Co.....
.... Cleveland.
Atlantic Works ..East Boston, Mass.
Buffalo Dry Dock Co.....Buffalo.
Chicago Ship Building Co.....
.... Chicago
Cramp, Wm. & Sons..Philadelphia.
Detroit Ship Building Co.....
.... Detroit
Great Lakes Engineering Works....
.... Detroit.
Lockwood Mfg. Co.....
.....East Boston, Mass.
Milwaukee Dry Dock Co.....
....Milwaukee.
Newport News Ship Building Co...
.....Newport News, Va.
Shipowners' Dry Dock Co.Chicago.
Superior Ship Building Co.....
.... Superior, Wis.
Tietjen & Lang Dry Dock Co.....
..... Hoboken, N. J.
Toledo Ship Building Co.....Toledo.

DREDGE BUILDERS.
Manitowoc Dry Dock Co.....
..... Manitowoc, Wis.

DYNAMOS.
General Electric Co.....
....Schenectady, N. Y.
Thropp & Sons, John E.....
....Trenton, N. J.

ELECTRIC HOISTS AND CRANES.
General Electric Co.....
.....Schenectady, N. Y.

ELECTRIC LIGHT AND POWER PLANTS.
General Electric Co.....
.....Schenectady, N. Y.
Thropp & Sons, John E.....
.....Trenton, N. J.

ENGINE BUILDERS, MARINE.
American Blower Co., Detroit, Mich.
American Ship Building Co.....
..... Cleveland.
Atlantic Works, East Boston, Mass.
Briggs, Marvin.....New York.
Chicago Ship Building Co., Chicago.
Chase Machine Co.....Cleveland.
Cramp, Wm. & Sons, Philadelphia.
Detroit Ship Building Co., Detroit.
Fletcher, W. & A. Co., Hoboken, N. J.

ENGINE BUILDERS—Continued.
Fore River Shipbuilding Co.....
..... Quincy, Mass.
Great Lakes Engineering Works....
..... Detroit, Mich.
Hall Bros. ..... Philadelphia.
Lockwood Mfg. Co.....
.....East Boston, Mass.
Maryland Steel Co.....
.....Sparrows Point, Md.
Milwaukee Dry Dock Co., Milwaukee.
Mosher, Chas. D.....New York.
Newport News Ship Building Co....
.....Newport News, Va.
New York Ship Building Co.....
.....Camden, N. J.
Northwestern Steam Boiler & Mfg. Co. ..... Duluth, Mich.
Quintard Iron Works Co., New York.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mfg. Co.....Milwaukee.
Superior Ship Building Co.....
..... Superior, Wis.
Thropp, J. E. & Sons Co.....
.....Trenton, N. J.
Toledo Ship Building Co.....Toledo.
Trout, H. G.....Buffalo.

ENGINE ROOM TELEGRAPH CALL BELLS, ETC.
Cory, Chas. & Son.....New York.
Marine Mfg. Supply Co., New York.

ENGINEERING SPECIALTIES AND SUPPLIES.
Lunkenheimer Co. ..... Cincinnati.
Northwestern Steam Boiler & Mfg. Co. ..... Duluth, Minn.

ENGINEERS, MARINE, MECHANICAL, CONSULTING.
Hynd, Alexander ..... Cleveland.
Hunt, Robt. W. & Co.....Chicago.
Kidd, Joseph.....Duluth, Minn.
Mosher, Chas. D.....New York.
Nacey, James ..... Cleveland.
Roelker, H. B.....New York.
Wood, W. J.....Chicago.

FANS.
American Blower Co., Detroit, Mich.

FEED WATER PURIFIERS AND HEATERS.
Ross Valve Co.....Troy, N. Y.
Wheeler Condenser & Engineering Co. ..... New York.

FIXTURES FOR LAMPS, OIL OR ELECTRIC.
General Electric Co.....
.....Schenectady, N. Y.

FORGINGS FOR CRANK, PROPELLER OR THRUST SHAFTS, ETC.
Cleveland City Forge & Iron Co....
..... Cleveland.
Fore River Shipbuilding Co.....
..... Quincy, Mass.

FLUE WELDING.
Fix's S. Sons.....Cleveland.

FUELING COMPANIES AND COAL DEALERS.
Hanna, M. A. & Co.....Cleveland.
Parker Bros. Co., Ltd.....Detroit.
Pickands, Mather & Co., Cleveland.
Pittsburg Coal Co.....Cleveland.
Smith, Stanley B., & Co., Detroit.
Toledo Fuel Company, ...Toledo, O.

FURNACES FOR BOILERS.
Continental Iron Works, New York

GAS BUOYS.
Safety Car Heating & Lighting Co..
..... New York.

GAS AND GASOLINE ENGINES.
Chase Machine Co.....Cleveland.

GAUGES, STEAM AND VACUUM.
Lunkenheimer Co. ..... Cincinnati.

GAUGES, WATER.
Lunkenheimer Co.....Cincinnati, O.

GENERATING SETS.
General Electric Co.....
.....Schenectady, N. Y.

GRAPHITE.
Dixon Crucible Co., Joseph.....
.....Jersey City, N. J.

HAMMERS, STEAM.
Chase Machine Co.....Cleveland.

HEATING AND VENTILATING APPARATUS.
American Blower Co., Detroit, Mich.

HOISTS FOR CARGO, ETC.
American Ship Building Co.....
..... Cleveland.
Brown Hoisting Machinery Co.....
..... Cleveland.
Chase Machine Co.....Cleveland.
Dake Engine Co.....
.....Grand Haven, Mich.
General Electric Co.....New York.
Hyde Windlass Co.....Bath, Me.
Marine Iron Co.....Bay City.

HOLLOW STAYBOLT IRON.
Falls Hollow Staybolt Co.....
.....Cuyahoga Falls, O.

HYDRAULIC DREDGES.
Great Lakes Engineering Works....
.... Detroit.

HYDRAULIC TOOLS.
Watson-Stillman Co., The.....
..... New York.

ICE MACHINERY.
Great Lakes Engineering Works....
..... Detroit.
Roelker, H. B.....New York.

INJECTORS.
American Injector Co.....Detroit.
Jenkins Bros.....New York.
Lunkenheimer Co. ..... Cincinnati.
Penberthy Injector Co.....
..... Detroit, Mich.

INSURANCE, MARINE.
Elphicke, C. W. & Co.....Chicago.
Gilchrist & Co., C. P.....Cleveland.
Hawgood & Co., W. A., Cleveland.
Helm & Co., D. T.....Duluth.
Hutchinson & Co.....Cleveland.
McCarthy, T. R.....Montreal.
McCurdy, Geo. L.....Chicago.
Mitchell & Co.....Cleveland.
Parker Bros. Co., Ltd.....Detroit.
Peck, Chas. E. & W. F.....
.....New York and Chicago.
Prindiville & Co.....Chicago.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.

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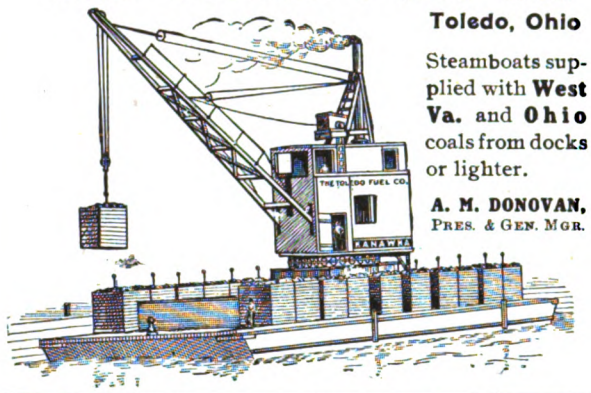

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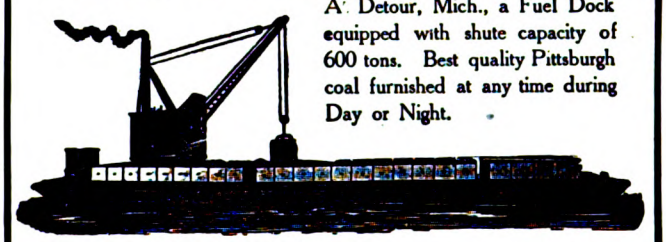

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IRON ORE AND PIG IRON.
Bourne-Fuller Co.....Cleveland, O.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co., Cleveland.

LAUNCHES—STEAM, NAPHTHA, ELECTRIC.
Truscott Boat Mfg. Co.....St. Joseph, Mich.

LIFE PRESERVERS, LIFE BOATS, BUOYS.
Armstrong Cork Co.....Pittsburg.
Carley Life Float Co.....New York, N. Y.
Drein, Thos. & Son..... Wilmington, Del.
Kahnweiler's Sons, D.....New York.

LIGHTS, SIDE AND SIGNAL.
Russell & Watson.....Buffalo.

LOGS.
Nicholson Ship Log Co., Cleveland.
Walker & Sons, Thomas..... Birmingham, Eng.

LUBRICATING GRAPHITE.
Dixon Crucible Co., Joseph.....Jersey City, N. J.

LUBRICATORS.
Lunkenheimer Co. ..... Cincinnati.

LUMBER.
Martin-Barriss Co. ..... Cleveland.

MACHINISTS.
Chase Machine Co.....Cleveland.
Hickler Bros., Sault Ste. Marie, Mich.
Lockwood Mfg. Co.....East Boston, Mass.

MACHINE TOOLS (WOOD WORKING).
Atlantic Works, Inc....Philadelphia.

MARINE RAILWAYS.
Hickler Bros., Sault Ste. Marie, Mich.

MARINE RAILWAYS, BUILDERS OF.
Crandall & Son, H. I.....East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York

MECHANICAL DRAFT FOR BOILERS.
American Ship Building Co..... Cleveland.
Detroit Ship Building Co., Detroit.
Great Lakes Engineering Works.... Detroit.

METALLIC PACKING.
Katzenstein, L. & Co., New York.
The National Metallic Packing Co..Oberlin, O.

MOTORS, GENERATORS—ELECTRIC.
General Electric Co.....Schenectady, N. Y.

NAUTICAL INSTRUMENTS.
Ritchie, E. S., & Sons..... Brookline, Mass.

NAVAL ARCHITECTS.
Hynd, Alexander .....Cleveland
Kidd, Joseph .....Duluth, Minn.
Mosher, Chas. D.....New York.
Nacey, James .....Cleveland
Wood, W. J.....Chicago

OAKUM.
Stratford, Oakum Co.....Jersey City, N. J.

OILS AND LUBRICANTS.
Dixon Crucible Co., Joseph.....Jersey City, N. J.

PACKING.
Jenkins Bros.....New York.
Katzenstein, L. & Co...New York.
Robertson, Jos. L. & Sons.....New York.
The National Metallic Packing Co... Oberlin, O.
Republic Belting & Supply Co.....Cleveland, O.

PAINTS.
Baker, Howard H. & Co....Buffalo.
Upson-Walton Co.....Cleveland.

PATTERN SHOP MACHINERY.
Atlantic Works, Inc. ..Philadelphia.

PILE DRIVING AND SUBMARINE WORK.
Buffalo Dredging Co.....Buffalo.
Dunbar & Sullivan Dredging Co.... Buffalo.
Great Lakes Dredge & Dock Co.... Chicago.
Hickler Bros..Sault Ste. Marie, Mich.
Hubbell Co., H. W...Saginaw, Mich.
Parker Bros. Co., Ltd.....Detroit.
Smith Co., L. P. & J. A...Cleveland.
Starke Dredge & Dock Co., C. H.....Milwaukee.
Sullivan, M.....Detroit.

PIPE, WROUGHT IRON.
Bourne-Fuller Co.....Cleveland, O.

PLANING MILL MACHINERY.
Atlantic Works, Inc....Philadelphia.

PLATES—SHIP, STRUCTURAL, ETC.
Bourne-Fuller Co.....Cleveland, O.
Otis Steel Co.....Cleveland.

PRESSURE REGULATORS.
Ross Valve Co.....Troy, N. Y.

PROPELLER WHEELS.
American Ship Building Co..... Cleveland.
Atlantic Works ..East Boston, Mass.
Cramp, Wm. & Sons..Philadelphia.
Detroit Ship Building Co....Detroit.
Fore River Shipbuilding Co..... Quincy, Mass.
Great Lakes Engineering Works.... Detroit.
Hyde Windlass Co.....Bath, Me.
Lockwood Mfg. Co.....East Boston, Mass.
Milwaukee Dry Dock Co.....Milwaukee.
Newport News Ship Building Co..Newport News, Va.
Roelker, H. B.....New York.
Sheriffs Mfg. Co.....Milwaukee.
Superior Ship Building Co.....Superior, Wis.
Thropp & Sons Co., J. E.....Trenton, N. J.
Toledo Ship Building Co.....Toledo.
Trout, H. G.....Buffalo.

PROJECTORS, ELECTRIC.
General Electric Co.....Schenectady, N. Y.

PUMPS FOR VARIOUS PURPOSES.
Great Lakes Engineering Works.. Detroit.
Kingsford Foundry & Machine Works .....Oswego, N. Y.
Wheeler Condenser & Engineering Co. .....New York.

REFRIGERATING APPARATUS.
Great Lakes Engineering Works.... Detroit.
Roelker, H. B.....New York.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register.....Cleveland.

RIVETS, STEEL FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland, O.

RUBBER SUPPLIES.
Republic Belting & Supply Co..... Cleveland, O

SAFETY VALVES.
Lunkenheimer Co.....Cincinnati.

SAIL MAKERS.
Baker, Howard H. & Co....Buffalo.
Upson-Walton Co.....Cleveland.

SALVAGE COMPANIES.
See Wrecking Companies.

SEARCH LIGHTS.
General Electric Co.....Schenectady, N. Y.

SHEARS.
See Punches, and Shears.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co.....Cleveland, O.
Otis Steel Co.....Cleveland.

SHIP BUILDERS.
American Ship Building Co..... Cleveland.
Atlantic Works ..East Boston, Mass.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons..Philadelphia.
Chicago Ship Building Co..Chicago.
Detroit Ship Building Co....Detroit.
Fore River Ship Building Co..... ..Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Lockwood Mfg. Co.....East Boston, Mass.
Manitowoc Dry Dock Co.....Manitowoc, Wis.
Maryland Steel Co.....Sparrow's Point, Md.
Milwaukee Dry Dock Co..... Milwaukee.
Newport News Ship Building Co...Newport News, Va.
New York Shipbuilding Co.....Camden, N. J.
Roach's Ship Yard.....Chester, Pa.
Shipowner's Dry Dock Co..Chicago.
Toledo Ship Building Co.....Toledo.

SHIP CHANDLERS.
Baker, Howard H. & Co....Buffalo.
Marine Mfg. & Supply Co..... New York.
Upson-Walton Co.....Cleveland.

SHIP DESIGNERS.
Kidd, Joseph .....Duluth.
Steel, Nacey, & Hynd....Cleveland.
Wood, W. J.....Chicago.

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SHIP LANTERNS AND LAMPS.
Upson-Walton Co..... Cleveland.

SHIP TIMBER.
Martin-Barriss Co.....Cleveland.

SIGNALS—SUBMARINE.
Submarine Signal Co.....Boston

SMOOTH-ON COMPOUND, FOR REPAIRS.
Smooth-On Mfg. Co.....
.....Jersey City, N. J.

STAYBOLT IRON OR STEEL BARS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....
.....Cuyahoga Falls, O.

STEAM VESSELS FOR SALE.
Holmes, Samuel .....New York.
McCarthy, T. R.....Montreal, Can.

STEAMSHIP LINES, PASS, AND FREIGHT.
American Line .....New York.
Anchor Line .....Buffalo.
Boston Steamship .....Boston.
C. & B. Transit Co.....Cleveland.
International Mercantile Marine Co.
.... Philadelphia.
Mallory Line .....New York.
New York & Cuba Mail S. S. Co..
....New York.
Red Star Line .....New York.

STEAM SPECIALTIES.
Robertson, Jas. L. & Sons ..New York.

STEEL CASTINGS.
Otis Steel Co.....Cleveland.

STEERING APPARATUS.
American Ship Building Co.....
....Cleveland.
Chase Machine Co.....Cleveland.
Dake Engine Co.....
.....Grand Haven, Mich.
Detroit Ship Building Co....Detroit.
Hyde Windlass Co.....Bath, Me.
Marine Mfg. & Supply Co.....
....New York.
Sheriffs Mfg. Co.....Wilwaukee.

SUBMARINE DIVING APPARATUS.
Morse & Son, A. J.....Boston.
Schrader's Son, Inc. A....New York.

SURVEYORS, MARINE.
Hynd, Alexander .....Cleveland.
Parker Bros. Co., Ltd.....Detroit.
Nacey, James .....Cleveland.
Steel, Adam .....Cleveland.
Wood, W. J.....Chicago.

TESTS OF MATERIALS.
Hunt, Robert W. & Co....Chicago.
Lunkenheimer Co....Cincinnati, O.

THERMIT
Goldschmidt Thermit Co.,
..... New York City.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS
Watson-Stillman Co.....New York.

TOOLS, WOOD WORKING.
Atlantic Works, Inc....Philadelphia.

TOWING MACHINES.
American Ship Windlass Co.....
.....Providence, R. I.
Chase Machine Co.....Cleveland

TOWING COMPANIES.
Donnelly Salvage & Wrecking Co..
.....Kingston, Ont.
Great Lakes Towing Co..Cleveland.

TRUCKS.
Boston & Lockport Block Co.....
..... Boston.

TUBING, SEAMLESS.
Shelby Steel Tube Co..Pittsburg, Pa.

VALVES, STEAM SPECIALTIES, ETC.
Jenkins Bros. .....New York
Lunkenheimer Co.....Cincinnati.
Ross Valve Co.....Troy, N. Y.

VALVES FOR WATER AND GAS.
Ashton Valve Co.,.....Boston.
Lunkenheimer Co.....Cincinnati.
Republic Belting & Supply Co.....
....Cleveland, O.
Ross Valve Co.....Troy, N. Y.

VESSEL AND FREIGHT AGENTS.
Boland, John J.....Buffalo.
Douglas, G. L. Jr.....Duluth
Elphicke, C. W. & Co.....Chicago.
Hall, John B.....Buffalo.
Helm & Co., D. T.....Duluth.
Hawgood & Co., W. A....Cleveland.
Holmes, Samuel .....New York.
Hutchinson & Co.....Cleveland.
McCarthy, T. R.....Montreal.

VESSELS AND FREIGHT AGENTS—Con.
Mitchell & Co.....Cleveland.
Parker Bros. Co., Ltd.....Detroit.
Prindiville & Co.....Chicago.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago

WATER GAUGES.
Lunkenheimer Co.....Cincinnati, O.

WHISTLES, STEAM.
Lunkenheimer Co.....Cincinnati.

WILFORD'S WATERPROOF CLOTH.
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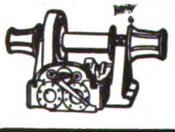
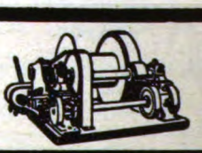

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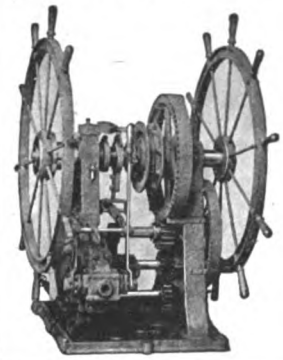

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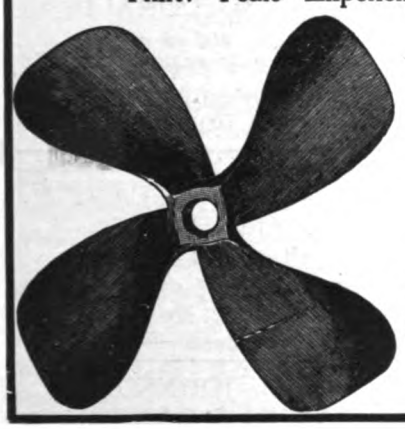

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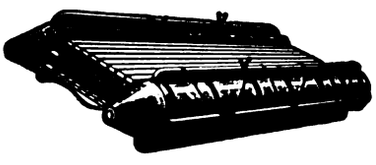

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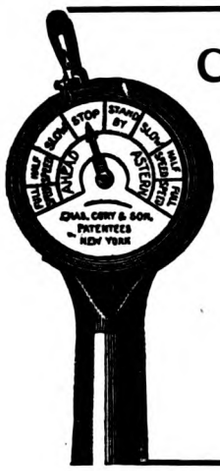

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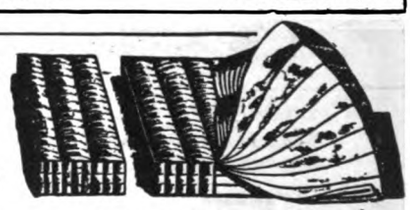

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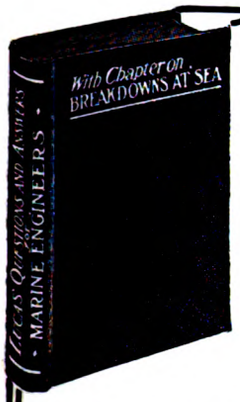

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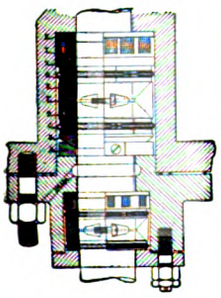

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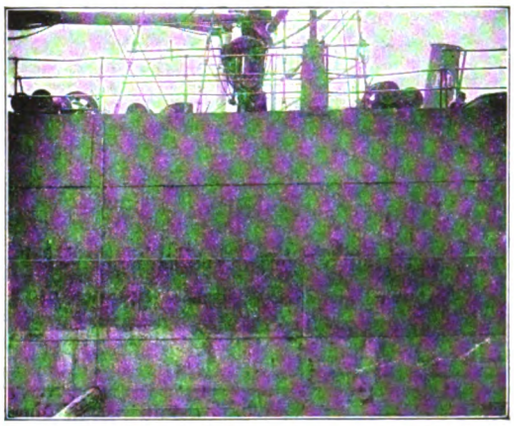

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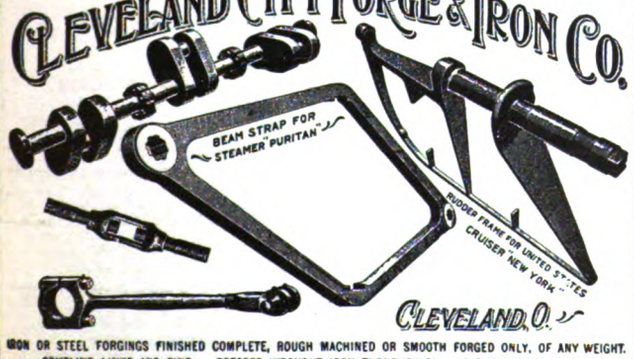

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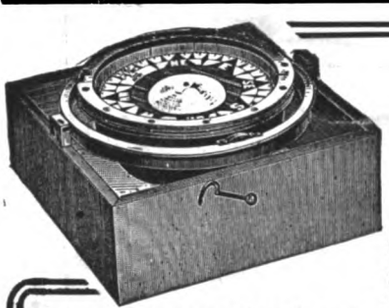

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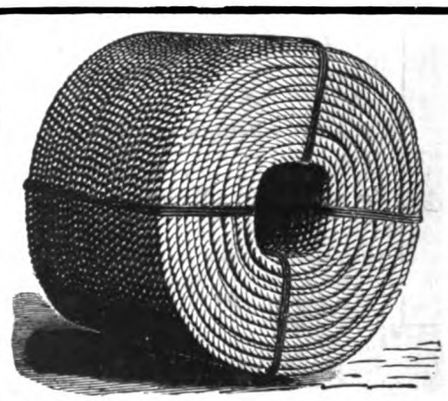

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